Treatment of Typhoid Fever.

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TREATMENT

OF

TYPHOID FEVER.

BY

D. D. STEWART, M.D.,

Lecturer on Clinical Medicine in the Jefferson Medical College, of Philadelphia; Physician to the Medical Dispensary of the Episcopal Hospital; formerly Attending Physician to St. Mary's Hospital, and to St. Christopher's Hospital for Children; Fellow of the College of Physicians of Philadelphia.

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TYPHOID FEVER.

PROPHYLAXIS OF TYPHOID FEVER, GENERAL AND SPECIAL.

Since it is now generally accepted that typhoid fever owes its origin to a pathogenic germ, and that the disease may be prevented and its dissemination obviated by attention to well established simple rules of hygiene, the comprehension of the latter is of prime importance to both practitioner and community.

Typhoid fever is undoubtedly due to a micro-organism which obtains entrance into the body by way of the intestines, generally through the ingestion of water contaminated with the fæcal discharge of a preceding case containing the germs of the disease. Of this there seems little question, though doubt yet exists whether the bacillus of Eberth is the only organism which has power to originate the disease. The recent investigations of Vaughan of Ann Arbor have led him, on good evidence, to believe the contrary—that the Eberth germ, as found in the spleen and other organs in cases of fatally ending typhoid, is not a specific micro-organism, but a modified or involution form of a number of related bacilli, all of which differ in form, size, and methods of growth and reaction towards stains, and which produce identical

poisons. He cites the view of Babes as the only tenable alternative, namely, that varieties of the Eberth bacillus exist; and the acceptance of this is tantamount to conceding his point, since it is practically the same, whether the germs are varieties of one species or belong to related species. Prior to Vaughan's investigations, Rodet and Roux, from a careful study of the subject, arrived at the conclusion that the common colon bacillus, which Hueppe had previously recognized as possessing pathogenic properties and as greatly resembling the Eberth germ, may become typhogenic under certain conditions outside the body—for instance, after a sojourn in cesspools and closets—and again entering the human organism, assume the character of the Eberth bacillus, and originate the disease. As to this aspect of the question, against that of those who hold both to the specificity and non-mutability of the Eberth germ and the possibility of related organisms under certain conditions originating the disease, there is much that may be said. The question, however, cannot be discussed here.* Suffice it that the subject at present is so involved in doubt as to render the greatest care habitually necessary regarding the disposition of even non-typhoidal excreta, and to make it obliga-

* See especially *Comptes Rendus des Séances de la Soc. Biolog.*, tome ii, No. 7, 1880, and Vallet's paper, "Le Bacillus Coli Communis dans des Rapports avec le Bacille d'Eberth de l'Etiolog. de le Fievre Typh.—Paris, 1892.

tory on health officers to do all in their power to guard against the possible pollution of drinking-water with fæcal discharges, whether these be supposed to originate from a suspected case of typhoid or not—especially, too, since cases of unrecognized typhoid are of no uncommon occurrence in all communities. The unquestionable communicability of typhoid from the sick to the healthy, through the stools, makes disinfection of these imperative.

By far the most common mode of conveyance of typhoid fever is by the contamination of drinking-water with excreta from a preëxisting case of the disease. This, as Brouardel has remarked, is the mode of transmission of the disease ninety-nine times in every hundred. Other and less common modes of dissemination are: by means of infected milk; through the soiled garments of typhoid cases; and more rarely, but especially in hot, dry seasons, through the transportation of the typhoidal poison in the dust of the atmosphere; the hands of the patient's attendants may also be the means of spreading the disease by coming in contact with articles of food or drink.

In water the typhoid germ may retain its vitality for upwards of a month, though commonly it is destroyed in a shorter time by ordinary putrefactive bacteria. In ice, as Prudden has shown, the germ may lose none of its virulence even for months. In milk the germ is capable of quite rapid multiplication. It is especially in fæcal matter and in poorly drained

soil that the bacillus finds conditions favorable for its existence and multiplication; in these it may remain virulent almost indefinitely. These briefly stated facts are of the utmost importance in indicating the necessity for thorough disinfection of typhoid dejecta in every case of the disease, which otherwise retains so much power for evil. A negligence in this direction is unfortunately common, and has on numerous occasions resulted in deplorable epidemics of apparently mysterious origin until careful investigation has finally traced these to their true source, too often to but a single case of the disease in which gross negligence was shown in the disposition of the stools.

All treatises on typhoid fever contain instances illustrative of this; only one need here be cited, that of Plymouth, Pa., in which, in the year 1885, lack of care in the disposition of the fæcal discharge of a single case resulted in the development of 1,200 cases of typhoid fever, and some 130 deaths, in a population of but 8,000. The starting-point of the epidemic was a case contracted in a distant city. The patient, on going to Plymouth, occupied a house on a hillside which sloped toward the town, and but a short distance from a mountain stream which at the time of the epidemic was the chief water-supply of the town. The case ran its course during midwinter and early spring, during which time the ground was frozen and snow-covered. The fæcal evacuations were thrown, without any attempt at disinfection, upon the snow

toward the stream. On the occurrence of thaws and rains in March, the three months' accumulation was washed, by the melting snow, into the stream supplying the town. Shortly after, the epidemic began.

Though water is much the most frequent source of transmission of typhoid fever, it must be borne in mind that milk not seldom plays the same rôle. Contamination of this fluid usually arises through the addition of infected water as a diluent, or through the use of water for cleansing the utensils, or, less commonly, through contamination of the milk on exposure to infected dust. Numerous instances of epidemics through infected milk are now on record. Pepper, in his article on "Typhoid Fever" in the American Text-Book of Practice of Medicine, cites several recent ones, and still later ones are recorded by Sedgwick and Chapin,* and by Dabney.† The epidemic investigated by Sedgwick and Chapin, which occurred in Summerville, Mass., it was found arose through the milk being infected from a well contaminated by typhoid dejecta. It was apparently the habit of the dealer to submerge the partly filled cans in the well for purposes of preservation. In some such manner, water from the well gained access to the milk. In this epidemic 150 cases occurred, with twenty-five deaths. There is no doubt that when an outbreak of

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* *Boston Medical and Surgical Journal*, vol. 129, No. 20.

† *Medical News*, Dec. 2, 1893.

typhoid fever occurs of undetermined origin, a careful scrutiny of the milk supply should be undertaken, coincidently with a search for the source of contamination through drinking-water. In referring to the epidemics occurring through infected milk studied by Sedgwick and Chapin and by Dabney, the *Medical News* (Dec. 9, 1893) remarks that if *all water and all milk used for personal and domestic purposes were sterilized, enteric fever would soon disappear.* There is undoubtedly much truth in this, for we actually know of no other sources than these for the origin of typhoid fever, beyond infection through ice or through vegetables eaten uncooked. What a pity there cannot be some concerted action and efficient legislation in all cities in which typhoid is prevalent, towards its suppression, through the supervision of the water- and milk-supply! Doubtless it will come finally, but not until many epidemics have also come and gone, leaving desolation in their wake.

Pettenkofer believes that the typhoid poison in the stools must undergo some alteration in the soil before it becomes infectious. It, however, seems impossible that the poison of typhoid fever can be disseminated through sewer-gas alone. Pettenkofer fancies that the disease is always transmitted through the "ground-air." He found in certain localities, such as Munich, that typhoid fever was more prevalent when the ground-water was low. He believes this to be due to the fact that with the recession of the

ground-water the air comes in contact with the germs and finally carries them into the atmosphere above-ground.

The explanation now generally accepted of the actual cause of the greater prevalence of typhoid fever with low ground-water, is that contaminated foci, such as cesspools, are more thoroughly drained by wells, springs, and other sources of drinking-water supply, the level of water in which is below that of the source of contamination.*

The foregoing facts give a slight idea of the prophylaxis necessary in preventing isolated cases or epidemics of typhoid fever, and a clue toward tracing them to their source after they have arisen. As almost without exception the source is found to be contaminated water or milk, it is obvious that in the event of an epidemic, apart from thorough attention to the disinfection of the excreta of the infected, a

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* Dr. H. B. Baker, of Michigan, confirms the opinion of Pettenkofer as to the greater prevalence of typhoid fever with low subsoil water, except in one important particular, and explains this relation more lucidly in the above manner. Baker (see Twelfth Annual Report of the Secretary of State Board of Health of Michigan, 1889) found that the rise and fall of the typhoid curve are in inverse ratio to that of the subsoil water in all seasons, *save in winter, when the ground is deeply frozen.* Then, of course, permeation of the soil by the infecting material is quite impossible, and contamination of drinking-water supply does not occur.

rigid scrutiny as to the origin of the disease through the water- or milk-supply should be made.

If the drinking-water or milk be suspected, another source of supply should be obtained if possible. Should this be impracticable as regards milk, it will be better to cease for a time its use, or at least to see that that consumed is most thoroughly boiled. If a second water-supply cannot be obtained, the drinking-water used should be first filtered and subsequently boiled before it is drunk. For culinary purposes thorough boiling is alone necessary. No filtering material now in use can be said to deliver water germ free for any length of time, not even the unglazed porcelain of the Chamberlain-Pasteur filter. This last, however, is so arranged that the filtering tubes of porcelain can be readily cleansed or sterilized as repeatedly as seems necessary, by boiling.† For this reason it is the best of the various household filters sold. The spongy-iron and porous stone rank next, though, apart from cleansing the surfaces, sterilization of these is not so readily accomplished, if indeed it can be done at all. Filters into whose composition charcoal enters, it is needless to state, rather increase the danger than diminish it after the first day or two's employment.

As practically the only danger of typhoid con-

† This, when there is serious question regarding contamination of water, should be done every two or three days, if the water is not boiled subsequent to filtration.

tagion arises through the stools, the disinfection of these alone of all the excretions need engage the physician's attention. By far the best disinfectant, as regards inexpensiveness, efficiency and practicability, is lime, either the milk or the solution of the chloride. Of milk of lime, a powder of freshly burned and slaked lime is stirred in twice its bulk of water, and the mixture, in volume somewhat greater than the stool to be disinfected, is added to the latter in the vessel.* This, thoroughly mixed with the stool, is sufficient to destroy the infecting principle in about half an hour. Or, if chloride of lime is preferred, a specimen containing at least *25 per cent. of available chlorine* should be obtained. A solution of this in the proportion of four ounces to the gallon is made, and about a quart used for the disinfection of each stool. One or the other of these preparations of lime, in point of efficiency and inexpensiveness unequaled, should be used in preference to all other disinfectants; they are as efficient in destroying the infecting principle of cholera as that of typhoid fever. In each case the stool *must be thoroughly broken up and incorporated by means of a stick with the lime, and allowed to stand before throwing into the water-*

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*F. P. Henry (Hare's System of Therapeutics, article "Typhoid Fever") states that he regards it sufficient to direct that slaked lime be mixed in an earthen or wooden vessel with enough water to make a thick whitewash. This is then added to the stool in the above manner.

closet, in the first instance a half-hour, and in the second at least one hour. Other disinfectants much used, such as corrosive sublimate, carbolic acid, the mineral acids (sulphuric or hydrochloric), copper sulphate, zinc chloride, or weak solutions of chlorinated soda, and the proprietary so-styled disinfectants—often so only in name—are not to be recommended. $HgCl_2$, even in acid solution, is a poor disinfectant for fæces; in proportion of even 1:500, thorough disinfection requires at least six hours through contact—and even in this time, should the stools contain blood, its efficiency is doubtful. It, like the mineral acids—which are recommended by some as efficient, used diluted with equal parts of water—is very destructive to plumbing. Carbolic acid, unfortunately still highly recommended by systematic writers, and largely used, even in 5-per-cent. solution requires for efficiency at least twenty-four hours' contact—so that is out of the question as a practicable disinfectant. The other agents mentioned, save the proprietary articles, will, in the strengths usually employed, if the contact is very prolonged, destroy the bacilli, but do not affect their spores. The costly proprietary preparations are, so far as is known, without effect even upon the germs themselves.

Even after thorough disinfection the stools should not be emptied upon the surface of the ground; and if they are buried, the situation should be remote from the source of drinking supply. Fæces must never

be buried undisinfected, even in the rural districts. What is generally recognized as the typhoid germ possesses extraordinary vitality in the fæces and in the soil. By experiment it has been shown that typhoid bacilli multiply even at the depth of three meters below the surface. They, moreover, possess great power of penetrating the soil, and have been known to pass many hundred feet beneath a mountain and infect a spring at its base.*

Disinfection of bed and body linen is, of course, essential, as these are likely to become infected from the fæcal discharges. The mattress of the sick-bed should always be protected by a rubber sheet placed immediately over it. Bed and body linen should be changed daily, or immediately if noticeably soiled. It is recommended by Fitz, quoted by Osler, that in hospital work and, if possible, in private practice, all changed linen, bath-towels, rubber sheets, and covers be immediately wrapped in a sheet soaked in carbolic acid (1:40), and removed to the rinse-house as soon as possible, to be there soaked for some hours in carbolic acid (1:40). The linens are then boiled for a half-hour, and washed with soft soap. The rubber sheets and covers are to be rinsed in cold water, dried, and aired for eight hours. The bed-spreads and blankets are also to be aired for eight hours daily. After the patient's discharge from the hospital the

* Billings: American Text-Book of Practice, p. 31.

mattresses are to be aired daily for a week. The bedstead is to be washed in corrosive sublimate (1:1000).

The hands of the nurse, not neglecting the nails, should be thoroughly cleansed with hot water and soap and subsequently washed with disinfectant solution, especially before eating after attention to the patient at stool. The nurse should also rinse the mouth well with a disinfectant solution, such as permanganate of potash or chlorinated soda. When the patient's temperature is taken by the mouth or rectum, the thermometer should of course always be thoroughly disinfected by being washed is a 1:500 $HgCl_2$ solution, or in a 10-per-cent. carbolic acid or strong chlorinated soda solution.

GENERAL MANAGEMENT OF A CASE OF TYPHOID FEVER.

Careful nursing is the one great essential. The case should be put in the hands of a careful nurse, to whom specific directions must be given, if necessary in writing, as to its management, even if the nurse be a trained one. Unless personally acquainted with her qualifications, the physician should himself at first superintend disinfection of discharges and the technique of baths, and had better give instructions in writing as to the administration of nourishment and the like.

The sick-room should be large, divested of all unnecessary trappings, and capable of being always well ventilated, with the bed so placed or screened that freedom from strong draughts is assured, though an abundance of fresh air is habitually admitted. Little danger to the patient from draughts exists while fever is present; yet, as Pepper justly observes, when recessions in the fever occur, with relaxation of the surface, congestions and increased catarrhal irritation may be readily induced by too great exposure. The room temperature should be maintained at about 65° F., and if in hot seasons it rises much above this it may be cooled by exposure of a large block of ice in a tub, as is recommended by Marston.

The bed must not be too wide, and should be so

placed that it may be approached from both sides by the attendant. The bed should be comfortable, but, whatever the patient has been accustomed to, he must not be permitted a feather or a flock mattress. The woven-wire spring mattress, over which a thin, soft hair mattress is placed, furnishes the best sick-bed; several folds of blankets may be placed over this, and between them and the sheet a rubber cloth to protect the blankets and mattress from infection. The bed-covering should be light, though efficient.

Great care is of course demanded to prevent bed-sores. The sheets should be changed daily, or oftener if soiled, and kept smooth beneath the patient, who must not be permitted to lie constantly in one position, that continuous pressure on dependent parts may be avoided. In some cases an air-, or preferably a water-bed may be required, especially in the later stages of the disease when the formation of bed-sores may seem imminent from the severity and protractedness of the case. As additional measures to prevent these, the back, sacrum, nates, and heels should also then be bathed in alcohol in which alum is dissolved, or with whiskey, or with spirits of camphor.

The smallest bed-sore appearing must be kept thoroughly cleansed with a weak solution of an antiseptic, such as carbolic acid, salicylic acid, potash permanganate, and then, as advised by Strümpell, may be dressed with some such preparation as an ointment containing one part of balsam of Peru to thirty of glycerite of

starch. Equal parts of boracic acid and iodoform ointment, is also a good salve. Robinson recommends one drachm of ichthyol in one ounce of flexible collodion. Some prefer a dry dressing, such as iodoform or iodol, in combination with finely pulverized zinc oxide.

When practicable, it is often desirable to have a second bed in an adjacent room to which the patient may be carried for the night. This is especially gratifying to him, should there be a tendency to marked insomnia or restlessness.

To obviate stomatitis, and especially parotitis and middle-ear inflammation, the patient's mouth must be frequently cleansed with some antiseptic solution, such as a very dilute permanganate-of-potash wash. In the later stages of the disease it may be necessary that a similar solution be employed, followed by a wash of boro-glycerid.

Complete rest in bed is imperative from the first day that the disease is suspected. By it, with control of our patient, we are reasonably certain of a favorable issue of the case. The patient under no circumstances should be permitted to make a long journey to reach his home, should the disease develop while he is away from it. There is no doubt that those cases do the best in every way and have fewer complications, with best chances of recovery, that have absolute rest, with careful nursing, from the earliest period of the disease. When the so-called

ambulatory cases, such as are so often encountered in hospitals, come under observation at the end of the first week or during the middle period of the disease, parenchymatous changes have occurred in the heart and other tissues as a result of the typhoidal toxæmia, *plus* the fever and over-exertion, leading to a fatal issue, which might have been averted by absolute rest from the beginning of the attack.

From the first the use of the urinal and bed pan must be insisted upon, however mild the case may seem. Inability to at first empty the bladder or open the bowels in this way, if present, is usually early overcome, and it is better to let the patient suffer the little inconvenience the novelty of this method may have for him at first, when his condition is favorable, than to run the risk of inability to habituate him subsequently when the occurrence of perforation or intestinal hæmorrhage renders the sitting posture out of the question.

Diet in Typhoid Fever.—Both because of the natural tendency in all acute febrile diseases to a disturbance of the digestive functions, with diminution in gastric secretory activity, and because in typhoid fever, especially, of the marked intestinal disturbance existent, it is of the highest importance that the aliment be of the most digestible sort, and that little or no residue be left to form fæces or act as an irritant to the ulcerated surface of the intestine. All authorities agree in considering milk in some form the best food

in typhoid fever. There is certainly none other that is so universally used, and about which so little judgment is exercised in its administration. Though milk is beyond doubt in itself the most complete of all single foods and, judiciously administered, the most practicable of all that can be employed in typhoid fever, it is an error to depend on it alone in the dietetic management of any case, since, despite the largest daily quantity that can be safely administered, properly diluted, the amount of albumin it contains is insufficient in an acute wasting ailment, such as typhoid fever, to prevent or replace the febrile consumption of the tissue albuminoids.

As regards the administration of milk, it must be borne in mind that though it is fluid outside the stomach, within the latter or within the bowel the casein must be coagulated before the digestion of the milk is possible. In any febrile ailment, but especially in typhoid, the use of milk undiluted cannot be too severely condemned. So used in this disease, the presence of undigested casein in the stools may usually be early noted, coincident with aggravation of symptoms of intestinal disturbances already existent. In typhoid fever, milk (and this presupposes the use of *good* milk) should always be given diluted. Much water is required by the patient, and considerable of this may well be administered added to the milk used. The diluent should be either plain water, lime-water, or an effervescing alkaline water

such as Vichy, Apollinaris, or soda-water. If an alkaline water is not used, it is better to add ten grains each of sodium bicarbonate and of chloride to the water diluting each half-pint of milk. This insures the more efficient digestion of the milk. From one to two quarts of pure milk, diluted about one-half with the vehicles described, should be administered in the course of twenty-four hours.

If milk diluted as described does not seem to agree, but causes flatulence and discomfort and aggravates the diarrhœa, with the presence of masses of casein in the stools, it must be discontinued, or may be given in the form of whey.* It may be peptonized plain or, in the manner I prefer, with gruel. The last is a highly nourishing and satisfactory form of fluid food in fevers.† Whey may be made more nour-

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* This is prepared by boiling one pint of milk with one to two teaspoonfuls of lemon-juice, and subsequently straining through muslin. Yeo suggests that the curd be thoroughly broken up after coagulation in order to express all the fluid from it. In this way much of the fat and some of the finely divided casein will pass into the whey, thereby increasing its nutritive properties.

† Directions for the peptonization of milk, milk gruels, and the like, usually accompany the packages of pancreatin and soda prepared for this purpose now on the market. These may also be obtained from any work on digestion. See, preferably, that of Roberts on "Diet and Digestion." It is well to have a care in peptonizing, that digestion does not proceed too far, as this will result in an unpleasant

ishing by the addition to it of beef broth, expressed meat-juice, or, occasionally, the yolk of an egg. If the last, the yolk is previously whipped up in a little hot water.

Peptonized milk may also be prepared with gelatin,‡ which latter assists in the division of the curd and is of undoubted value as a nutrient and albumin-sparing food in typhoid fever. Preparations with gelatin must be given, however, with caution if there is much tendency to intestinal irritation. During convalescence they are of great value in varying the monotony of soft diet. If buttermilk is craved, it may be given.

In addition to milk, or the preparations of it taking the place of milk when it disagrees, meat broths are of the greatest utility in typhoid fever. When the case is a light one without marked adynamia, the ordinary home preparations of strained chicken-, mutton-, or beef-broth, or *consommé*, may be used, alternating with milk. Often, however, meat preparations richer in albumin than the decoctions are

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bitter taste, rendering the milk or milk-gruel unpalatable. The gruel must, of course, be strained while hot. The last is usually highly acceptable to the patient's palate and agrees well.

‡ After the milk is peptonized, it is brought to the boiling-point to insure destruction of the ferment, which otherwise would act on the gelatin and prevent it from solidifying. The gelatin is added to the milk while it is yet hot.

demanded. Cold-made infusions may then be used after Roberts' process. (See *l. c.*, p. 185.) These are high in nutritive value, but as they cannot be cooked without solidifying, from the amount of albumin they contain, their raw flavor is apparent and objectionable to many. This last, however, may be disguised by the addition of some ordinary beef-tea or a slice of lemon or a little claret.

Of the various preparations of beef on the market for the sick, the most nutritive, as well as the most palatable by far, is that sold under the name of Mosquera's beef-jelly, a predigested paste of beef, containing, according to the analysis of Ludwig of Vienna, over 53 per cent. of soluble albuminoids which have been almost entirely converted into peptones. The digestion of this preparation of so-called jelly is done with the juice of the pineapple, which is now known to possess extraordinary proteolytic powers, readily promoting proteoses and peptones from albumin without imparting the disagreeable flavor and odor common to meat preparations digested with the animal ferments. But 3 per cent. of this beef-jelly is insoluble matter, so that it forms a perfect food for cases of typhoid fever when concentrated nourishment is necessary. I have used this preparation for several years in preference to any other form on the market, for it certainly incomparably outranks them all in point of nutritive value and agreeableness of flavor. I now rarely treat a case of severe typhoid

fever in private or hospital practice without it. A small teaspoonful is added to the cup of boiling water or to an equal quantity of chicken- or mutton-broth or *consommé*. Boiling a few minutes improves its flavor. During convalescence it may be prepared in the same way with the addition of the yolk of an egg. When the latter is added, it first is beaten up with the beef-jelly, then added to the diluent; or the beef-jelly may be added in the preparation of ordinary hot chocolate or cocoa, which is occasionally admissible through the course of the disease, but especially during convalescence.

It has been commonly recommended that two to three pints of milk and one to one-and-one-half pints of beef tea, or some equivalent, be given in the twenty-four hours, and that is generally supposed to be about the quantity of fluid food necessary to properly sustain the average patient through an attack of typhoid fever. The intervals of feeding should be about two to three hours, and a trifle longer interval may be allowable through the night, should the patient's condition be good and his sleep sound. If the patient is doing well and sleeps soundly at night, he need not be disturbed for nourishment for a much longer interval, nor by day for at least three to four hours when a fair proportion of the twenty-four hours' nourishment is taken on each occasion.

The tendency is oftentimes to over-feed in typhoid fever. The key to the regulation of the

diet, as to the amount and sort of food administered, as has been insisted upon by Broadbent, is to be found in the careful and frequent inspection of the stools. The daily inspection of at least one stool by the physician is essential, however trustworthy he may believe the report of the nurse to be regarding the appearance of the evacuations. A tendency to undue looseness of the bowels is sometimes manifested under beef tea, so that this, as well as the danger of indigestion from milk, must also be borne in mind, and symptoms appearing must be promptly met by either a withdrawal or diminution in the quantity, or a change in the mode of administration, of the offending substance.

However ardently fruit may be craved, it is not generally allowable in typhoid fever. The juice of an orange, small quantities of lemonade, and, occasionally, the pulp of a few white grapes, may, however, be permitted if but little diarrhœa exists.

It cannot be too strongly urged on the physician that pure water be allowed the patient in abundant quantity from the start. This is of the greatest importance in the successful management of the case, and should be impressed upon the care-taker. The patient's senses are often so obtunded that he is incapable of realizing his wants in this direction. Water should be given freely, though in not too large quantity at a time. In addition to that which enters into combination with the milk and meat preparations ad-

ministered, it should be given in an uncombined state, plain or aërated, in small quantity and often.

Alcohol must not be given as a matter of routine in the treatment of typhoid fever, as is too often the practice of the medical tyro. It is not, as a rule, required in the early stage of the disease, and often in mild cases not at all throughout the entire course of the fever, save perhaps as a light wine or malt liquor during a somewhat protracted convalescence. It should preferably only be given to meet certain indications, the chief of which is the onset of marked circulatory weakness, with such evidence of cardiac failure as a toneless or absent first sound and a frequent, weak pulse. But while its use should not be routinely resorted to, its employment must not be withheld until a state of extreme exhaustion results, from which it may be quite impossible to rescue the patient even with our most approved aids at hand. This condition should always be anticipated, as much as can be, by the timely use of spirits. In those cases in which signs of circulatory failure are present, there is also apt to be considerable elevation of temperature and the presence of nervous symptoms, marked dullness of intellect, tremor, a dry, brown, glazed tongue, with sordes—the case indeed being in that hopeless state so well known as the typhoidal. In the typhoid state it is often surprising to note the amount of spirits that may be administered without the alcohol-breath being apparent. Here, too, its effect upon the

pulse, increasing tension and volume, and lowering frequency, and upon the nervous phenomena, lessening restlessness, delirium, stupor, and tremor, is often most gratifying. Should, on the contrary, these symptoms rather be aggravated by its use, in doses which are certain to have had effect, the indication is that for some reason, perhaps excessive dosage, the alcohol is provocative of harm.

Apart from the general use of alcohol in typhoid fever, stimulants are frequently freely required in the complications of the disease, such as severe bronchitis, pneumonia, or the condition of approaching collapse from hæmorrhage. Pepper states that in patients beyond forty years of age, even though of previously temperate habits, and younger ones who have been intemperate, alcohol had better be given in small quantity early.

Whisky is the form of alcohol most frequently used. A wholesome brandy is quite out of the question save at a cost beyond the reach of any except the very well-to-do, and even at a considerable cost one is apt to be deceived by a factitious preparation most harmful of administration through the poisonous alcohols it contains. Champagne, though especially serviceable to meet certain indications, such as excessive irritability of the stomach, or the sudden approach of collapse, is of less utility as a stimulant for habitual daily use in typhoid fever. The amount of whisky or brandy required depends entirely upon

the condition to relieve which it is given, varying from one ounce in the twenty-four hours to that amount even hourly in cases in which the typhoid state is profound. It should be administered well diluted with plain water, carbonated water, or in milk, and if necessary the dose may be frequently repeated.

Diet during Convalescence.—After the subsidence of fever and the approach of convalescence, a more liberal diet is allowable—eggs whipped with milk, containing a little wine, whisky, or brandy; eggs poached or lightly boiled; preparations of gelatin, blanc mange, and the like; the soft part of oysters, milk toast, and milk puddings, are all permissible; but no really solid food should be allowed until convalescence is well advanced—it must not be permitted while the least tendency to diarrhœa exists, nor should it be allowed until the temperature has been normal for a week. Not infrequently what has seemed but a slight indiscretion in diet has apparently been the means of precipitating a recrudescence of the fever, and more than once perforation, followed by collapse and death, has succeeded a too early indulgence of the appetite in cases in which typhoid ulcers have not completely healed, though the temperature has been normal for several days.

In all severe cases, as before remarked, the digestive functions are usually profoundly affected, especially the gastric—and probably the pancreatic—secretory activity; and these cannot be expected to

resume their normal condition immediately with the subsidence of the fever. In all cases in which semi-solid food, or subsequently the light solid food at first given, causes symptoms of indigestion, especially such as oppression in the epigastrium, with flatulence soon after meals, either the nourishment should be administered predigested, or digestants should be liberally taken at the time of eating. An active malt extract is of the greatest value in these cases, given immediately before the meal; and after a meal in which albuminoid food forms a part, either a good preparation of papain or pepsin should be used. Of course, if the latter is prescribed, it should only be in combination with dilute hydrochloric acid, and this in quantity not less than half a drachm, to obtain any digestive action.

Among the countless remedies and many plans suggested for the successful management of a case of typhoid fever, but two methods of treatment at the present day are alone worthy of detailed mention: First, the justly celebrated Brand method of baths; and, Second, the use of certain antiseptic drugs supposed to exert a lethal effect upon the germs of the disease or an antidoting action upon their toxic products. All other forms of treatment, excepting the antipyretic by drugs (which is considered in the managements of the complications), may be included in what has been long termed the *expectant* and the *expectant-symptomatic*. The names of these are suffi-

ciently self-explanatory and, as plans of treatment pure and simple, self-condemnatory, to deserve no extended mention in this book. The expectant method, and the expectant-symptomatic plan of treatment, which can now be said to be obsolete with the progressive physician, were once more or less the prevailing methods, when little existed to indicate that either the duration of the fever or the severity of the symptoms could be markedly controlled by therapeutic measures.

By the expectant method, nothing whatever was knowingly done on the part of the attendant to influence the cause or the duration of the disease, save attention to matters of hygiene, such as diet and the like. In the expectant-symptomatic, or so-called *rational* plan, no attempt was made to foresee or guard against the appearance of ill-omened symptoms or to reach their cause. Here effort was alone made, as best it could be, to treat these symptoms as they arose. But, as Wilson * so understandingly remarks, too often the appearance of grave symptoms indicates mischief already past remedy; hence the aim of treat-

* These various plans are considered in a splendid article by J. C. Wilson on the Treatment of Typhoid Fever with special reference to the method of Brand (Medical News, Dec. 6, 1890). I am indebted to this paper and others by Professor Wilson for many points of value in what follows concerning the method of Brand, advocated with such ability by this distinguished clinician.

ment must not be simply to control serious symptoms as they arise, but, by acting upon their cause from the beginning, to anticipate their development. It would appear that it is within our power to do this in all cases of typhoid fever, provided we can have control of them from the start, or before the disease has gained sufficient headway to baffle our efforts.

As the method of baths, more especially that of Brand, is in effect far-and-away superior to all other plans of treatment extant, or to any known remedy or combination of drugs, it will receive priority of mention, as it should also receive priority of thought by every one called upon to treat cases of typhoid fever.

Through an utter lack of conception of the immense influence for good which the Brand method of baths, applied from the earliest period in the fever, has been shown to exert—not alone on the febrile condition itself, but also on the multiplicity of symptoms originated by the toxic process—the method is usually narrowly classed with antipyretics as a remedy for reduction of fever heat alone. This is especially common practice with English and American clinicians writing on the treatment of typhoid fever, with the noteworthy exception in this country of J. C. Wilson and Simon Baruch, to both of whom so much credit is due for that continued warm advocacy of the method which has done so much in this country to popularize and introduce it, not alone in our hospitals,

but in private practice as well. It cannot here be too strongly insisted that the treatment by the Brand method of baths, when early and intelligently applied, exerts in the majority of cases of typhoid fever an effect so extraordinary that were such obtained by the use of any single antipyretic drug, supposedly acting by virtue of an antidotal power over the typhoid germ or its toxines, it would be lauded as a specific, and further search for a remedy would in all probability be abandoned. For indeed the effects of the Brand method, when resorted to early, are little short of specific, and have, somewhat for this reason, been likened by Baruch to the action of quinine in the early treatment of the severer forms of malarial fevers. Regarding this, Baruch remarks: "Any one who has, like myself, treated a large number of cases of the severe types of bilious, remittent and congestive fevers on the Southern river-banks, has realized how important it is to cinchonize the patient at the earliest possible moment in order to prevent the recurrence of the paroxysm, which brings parenchymatous changes in its train. When the latter are once established, the fever continues despite the best directed administration of quinine. The antagonistic specific effect of quinine is no longer required; we have a hepatitis, a gastritis, or splenic enlargement to treat, with which we are unable to cope successfully. But if the malarial element be not wisely met by quinine, the patient will surely die from the combination

of the malarial and the parenchymatous diseases. So it is with typhoid fever. The cold bath represents the effect of quinine in malarial fevers; although it has not the specific antidotal effect, the cold bath applied in the early stage has the same prophylactic effect in preventing parenchymatous degenerations."

Prior to the introduction of systematic cold baths, after the method of Brand, in the treatment of typhoid fever, statistics everywhere showed under all modes of treatment a mortality of startling height in comparison to that now exhibited under the use of the Brand method, even when modified or carried out with details unlike those insisted upon by Brand. Thus, of 11,124 cases in Germany under the so-called expectant treatment, the mortality amounted to somewhat over 21 per cent.; in upward of 14,000 cases under treatment in the various London hospitals, the mortality averaged some 17.8 per cent. Murchison collected some 27,000 cases, with an average mortality of 17.45 per cent. Of cases treated in Europe, Jaccoud collected 80,140 cases, with a mortality of 19.23 per cent. In the New York Hospital, over a series of some six years, during which 1,305 cases were studied, the mortality estimated by years varied between a minimum of 20.1 per cent. in 1879 and a maximum of 30 per cent. in 1890.* These figures

* Delafield, quoted by Wilson. I am indebted to Dr. Baruch's most excellent manual on The Uses of Water in Modern Medicine, for many of the statistics here given.

show that the mortality of typhoid fever everywhere under the most favorable auspices, excepting baths, runs between 15 and 25 per cent. In private practice, for various reasons, much less mortality prevails, 10 per cent. being recorded by most observers as a fair average.

The fact, however, must not be lost sight of, that unless a very large series of cases are selected in computing results, deductions drawn from methods of treatment are little to be depended upon. Thus, Professor Pepper once treated a series of 100 consecutive cases of typhoid fever in private practice with nitrate of silver. As in these the mortality was *nil*, it might be concluded that we have in nitrate of silver a remedy approaching the specific in its effects in the treatment of this disease; and yet, so far as I am aware, this remedy, though quite generally used (largely because of Pepper's warm and continued advocacy), has been found of no especial value by others, no better results being obtained with it than under the expectant plan of treatment. In localities in which typhoid fever is endemic, such as Philadelphia, and in localities in which it occurs as an epidemic, it sometimes happens that the majority of cases are especially mild, as is often the case with other of the acute infectious diseases; in the treatment of these mild cases, especially when occurring among the well-to-do in private practice, markedly good results are often obtained in series of cases by the use of some drug or

treatment dictated by the fancy of the attendant, which results are undoubtedly of the *post hoc* and not of the *propter hoc* order. The cases being mild in character and taking early to their bed, good nursing alone would have been efficient to bring about recovery. It is otherwise when statistics are gathered from extensive series of cases occurring in different localities over long periods, as is now the case with those furnished by the adherents of the Brand treatment of typhoid fever. Thus, Brand's carefully collected statistics of 19,017 cases show that under all kinds of cold-water treatment, in which in many cases no strict enforcement was observed, the mortality sank from 21.8 to 7.8 per cent. In 2,198 other cases collected by Brand from various sources in which his method was carefully carried out, the mortality was 1.7 per cent.; and in 1,223 cases in private life, civil and military hospitals, treated by Jurgensen, Vogel, and Brand, there was a mortality of only one per cent., of which deaths (twelve) not one occurred in any case coming under observation before the fifth day of the disease.

Though the excellence of Brand's results was apparent soon after his first publication on the subject in 1861, and in marked contrast to the results obtained by other methods of treatment, many years elapsed before the recognition was accorded them that was their due, even in Germany; and though in France, through Glénard of Lyons—who, as a prisoner

of war in Stettin, in 1873, witnessed the extraordinary successes of Brand,—the method has become very popular, with results similar to those of Brand, scant headway has been obtained for it in this country or in England.*

In this country it has been taken up especially by Baruch, Wilson, Sihler, Thompson, Peabody, Smythe, and Borning, all of whom have reported series of cases with results confirmatory of those of Brand.

There seems no doubt that for the most benefit to occur from the method, the earlier in the case the treatment is begun the better. So convinced was Brand especially of this that he positively asserted not only that all cases coming under treatment before the fifth day of the disease ran a milder course, but that all such should recover. The experience of all other observers in all military hospitals in which the cases come under observation early, support this view, as does the fact of the invariable higher mortality of

* The case is different in one of the colonies. Hare, of Australia (*Practitioner*, March, 1891), reported a large series of cases treated by the bath, but with the coincident use of antifebrin and quinine. His mortality in 1,173 cases was 7.84 per cent., about the same as that obtained by Vogel in his hospital under the same mixed treatment. Apparently a much less mortality might have been expected under the strict cold-bath treatment. Still, this percentage of deaths, compared with that of 14.82 in 1,828 cases previously treated by the expectant method, is very significant.

cases treated later reported by these and other observers.

It would appear that the very early use of the Brand method, before marked systemic infection has occurred, will in the majority of instances, when faithfully carried out, prevent the latter. It has even been asserted that little or no intestinal ulceration ensues, the alteration in Peyer's patches not going beyond the stage of infiltration. This seems not improbable, in view of the favorable course the majority of cases pursue when they are brought under this treatment in the early stage of the disease; in these, the diminution in intestinal symptoms, cessation of excessive diarrhœa, early cleaning of the tongue, and the appearance of appetite, demonstrate the remarkable effect that this treatment must have on the infection. The experiments of Roque and Weil,* which were made for the purpose of studying the elimination of toxines in typhoid fever, show that in patients treated by the cold-bath method the uro-toxic coefficient† becomes greatly increased, attaining an amount equal to five or six times the normal. This increase lessens with decline in temperature and general improvement in symptoms, and falls to normal coincidently with disappearance of fever. While under no treatment the uro-toxic coefficient is only about double that of

* *Rev. de Méd.*, December, 1891.

† "The quantity of toxic matter which a unit of weight produces in a unit of time." Bouchard: "Auto-Intoxication in Disease."

health, and continues above normal for four or five weeks after abatement of fever, under antipyrin during the fever it falls below the normal, to become enormously increased during convalescence. This shows a decidedly harmful action on the part of antipyrin in promoting retention of toxines, which effect is also produced by other of the coal-tar antipyretics. This also indicates the special value of the cold-bath treatment in promotng elimination of the toxic products of the disease.

The technique of the method of Brand is so well given by Wilson in his paper before referred to that I here excerpt the following describing it:

"Whenever the temperature taken in the rectum reaches 102.2° F. (39° C.) the patient is placed in a bath of 65° F. A compress, wet with water about five degrees lower, is placed upon the head, or water at a lower temperature is poured upon the head and shoulders. The patient remains in the bath fifteen minutes, during which time he is systematically rubbed by the attendants and encouraged to rub himself. At the expiration of that time he is removed from the bath, and wrapped in a coarse linen sheet over which a blanket is folded, the extremities being thoroughly dried and rubbed. A little wine or spirits is then given. This is repeated every three hours, unless the temperature remains below 102.2° F. The alimentation is liquid, nutritious, and carefully regulated. No drugs are administered.

"Glénard* gives the following outline of the technique of the treatment by cold baths:

"'If the diagnosis of typhoid fever is probable, recourse should be had to the baths, whatever may be the symptoms. The full tub should be placed in the ward or chamber, parallel to the bed at a distance of one or two metres, the floors properly protected by oilcloth, and a screen placed between the bed and the bath-tub. A sufficient quantity of water should be used to cover the patient's body to the neck. It should be of a temperature of from 64.4° to 68° F. (18° to 20° C.). The baths should be prepared without disturbance or noise. There should be placed on the floor near the head of the tub two pitchers of cold water of a temperature of from 46.4° to 50° F. (8° to 10° C.), each containing four or five quarts (litres). A glass of water should be at hand. The first bath should be given preferably about four o'clock in the afternoon, unless there is some urgent reason for selecting a different hour; and the physician should be present. The rectal temperature is taken, the urine is voided, and the patient is assisted into the full tub, the screen having been removed. If there is perspiration, the patient is dried before entering the bath. Cold water from the pitchers is poured upon the head and the back of the neck, for one or two minutes, the amount being from two to three quarts

* *Le Bulletin Médicale*, Feb. 26, 1888.

(litres). Then a swallow of cold water or red wine is given. This being done, the whole surface of the body is briskly rubbed with a sponge or brush, and the patient is made to rub his abdomen and chest.† These frictions stimulate the peripheral circulation, prevent the accumulation of heat at any one point, moderate the sensation of cold, and help to pass the time; they are not indispensable. Shivering appears, as a general rule, in between eight and twelve minutes; this is a necessary evil to which too much attention is not to be paid. Toward the middle of the bath, or at its termination, cold water is again poured over the head and neck. The time occupied ought to be at least fifteen minutes—longer if the head is still warm and the cheeks red, or if the temperature of the patient was very high before the bath.

"'The patient should leave the bath without precipitation. He cannot take cold—thoracic complications are caused by typhoid fever and not by chilling. The air of the apartment should be pure and not too warm; the window should be opened in the intervals between the baths—during the bath it ought to be closed. On leaving the bath, the patient should be gently dried with a towel. The bed should be care-

[†Too much attention cannot be paid to the application of thorough friction. The physician, or a trained substitute, should always be on hand to superintend the baths, at least until the attendants are themselves thoroughly versed in the technique.—D. D. S.]

fully made during each bath. If on returning to the bed shivering takes place, the limbs should be rubbed and a hot bottle placed at the patient's feet. A cold compress, covered with oil-silk or flannel, should be placed over the abdomen, and a little warm nourishment administered.

"'Three-quarters of an hour after the bath the rectal temperature should again be taken. If, however, it is found to be below 101° F. (38.5° C.), it is not necessary to take it again for three hours.

* * * * * * * * * *

"'Neither age, sex, menstruation, pregnancy, nor sweating (except that which occurs at the end of defervescence) in any way modifies the treatment. In women who are weaning their children, cold compresses should be applied to the breasts and frequently renewed. If diarrhœa persists, it is to be combated by cold compresses, which may be kept cold by the aid of a bladder of ice. If there is constipation, it is to be treated by cold enemata, and, if these fail, by enemata consisting of one part of cold water and one part of fresh ox-gall.

"'When the temperature before the bath is very high, or if the fall forty-five minutes after the bath is less than 1.8° F. (1° C.)., the bath must be prolonged to eighteen or twenty minutes. It is very rarely necessary to modify the general formula. After the temperature does not exceed 102.2° F. (39° C.), but yet reaches 101° F. (38.5° C.), it is necessary to treat

these slight exacerbations by baths of 68° F. (20° C.) and of five minutes' duration in order to prevent the prolongation of the fever or the occurrence of relapse, and to shorten convalescence. If relapse occurs, it must be treated according to the general formula. When the temperature no longer exceeds 101° F. (38.5° C.), defervescence being established, the baths are discontinued, and the patient should be treated as convalescent, but is to be kept in bed until the temperature has not exceeded 100.4° F. (38° C). for four days. He may then rise, and in a short time walk in the open air; he may prolong his promenades according to his strength, and one will be struck by the rapidity with which his strength increases after every outing. Proper precautions are to be taken against cold.

"'During the treatment by baths, one attendant is required for the day and one for the night; these duties may be fulfilled by members of the family. In a hospital one bath-tub may be used for a dozen patients, but it is better to use one for every six patients. Two attendants are sufficieut for twelve patients. It is not necessary to renew the water of the bath every three hours; once in twenty-four hours is sufficient. The patient treated from the beginning in this manner, never suffers from fæcal incontinence. As a rule, the patient should pass his water before entering the bath. During epidemics, the water of the bath, if it is not soiled, should serve for several

patients, and should only be renewed two or three times a day.'

"This," states Dr. Wilson, "is the line of treatment to which, rigorously carried out, the extraordinary results which I have indicated are ascribed. That it seems heroic, thus briefly stated, cannot be denied. That it is heroic to those who see it practiced for the first time, is more than true. Preconceived notions in regard to the management of typhoid cases are violated. The frequent disturbance for the purpose of taking temperatures and bathing, the fact that the patients are compelled to rise from their bed and with the aid of the attendants to step into the bath, the pallor, shivering, and the blueness of the extremities which shows itself during the course of the bath and continues for a varying time after the patient is put to bed, demand conviction on the part of the physician, and the courage of conviction to continue.

"It is only when the favorable effect upon the condition of the patient is seen, and when we reflect that in every hundred cases at least ten lives which would be lost under the expectant-symptomatic treatment are saved by strict cold bathing, that we dare to proceed.

"What is the effect upon the course of the disease in cases treated from the beginning—that is, before the fifth day? Brand declares that the classical picture of typhoid fever is no longer seen. It may

be objected to this that we do not get our cases before the fifth day, and even if they come under observation so early a positive diagnosis cannot always be made at that time. Only in garrison life and in epidemics will a treatment so radical be justifiable at the onset of a vague febrile disease. But Brand's statement is true of cases in which treatment is instituted at a later period, even so late as the middle of the second week. After six or eight baths the familiar picture is no longer seen. Delirium ceases; stupor gives way to light somnolence from which the patient is easily aroused with a bright expression and a clear mind. The tongue becomes moist and clean, and remains so. There is desire for food, and very commonly a complaint of hunger. The abdomen is not tympanitic. Diarrhœa is rarely excessive or troublesome. In short, there remains, in the words of Brand, of the ordinary picture of typhoid nothing more than (*a*) a moderate fever, (*b*) an unimportant bronchial catarrh, (*c*) enlargement of the spleen, (*d*) the rose rash, and (*e*) infiltration of the intestinal glands. Everything else is prevented, and what might have been a severe case runs its course as a mild one if the patient is brought under treatment sufficiently early. Exceptions to this statement occur only when complications develop at the onset. There are rapid wasting and progressive anæmia, as in all prolonged febrile diseases, but severe enteric fever is changed to mild, the mild to a still milder form.

This is brought about through the control of the temperature and by preventing disturbances of normal functions. The treatment is directed against the typhoid process as an entirety.

"It does, it is true, not only reduce the temperature; the repetition of the bath also *controls* the temperature and keeps it down. But the bath does much more than this. It acts upon the nervous system in such a manner as to enable it to withstand the toxic influences of the infecting principle and the products of its evolution. This it doubtless does by the action of cold water upon the peripheral nerve-endings, a reflex stimulus being transmitted to the nerve-centres presiding over the circulation, respiration, digestion, excretion, and nutrition. This general reinforcement of function is shown by improved action of the heart, the first sound continuing distinct, the pulse being slower and more regular, and the improvement in the arterial tension showing itself by an absence of dicrotism; by persistence of appetite and digestive power, permitting freer alimenation without gastric disturbances; by deepening and slowing of the respiration; and by the absence of nervous symptoms, the increased excretion, the prevention of complications, and the rapid convalescence.

"As was pointed out by Jürgensen, every attempt to deviate from the routine treatment as above laid down is followed by less satisfactory results. The treatment thus stands by itself as a definite procedure,

to be distinguished from treatment by graduated baths, the cold pack, cold affusions, spraying, and other hydro-therapeutic measures. It is especially to be looked upon as something distinct and different from the antipyretic treatment. Upon this Brand and his followers insist."

The following paragraph is from Baruch's most excellent book:

"The question has been asked: Is the rule to bathe every three hours in winter, at 65° F., whenever the temperature reaches 103° F., absolute, and not to be modified to adapt it to each case? Most assuredly I would rarely deviate from the rule except in the beginning, when patients' peculiarities may be noted; because this rule has been established by deductions from large clinical material, carefully gathered by numerous observers in different localities, in private, hospital, and military practice. It must always be borne in mind, too, that the object of the bath is prophylactic; its aim is not a mere reduction of temperature, but a suppression of the violence of the febrile movement until it has spent its force. Whoever expects to throttle the fever by the bath will surely be disappointed, for its course is as steady and inexorable as any law of nature. The temperature will almost invariably fall from one to three degrees after each bath, only, however, to rise again to within a fraction of its former rate when three-hourly examination is made. But from day to day there will

be a gradual yet steady diminution of the average temperature, which indicates that the resisting power of the system is gaining sway over the disease. This is the usual effect of the systematic cold bath, administered without fear and without favor. Whenever we attempt to substitute another form of hydriatic procedure, to raise the temperature of the bath water, to shorten the duration of the bath, or otherwise to change the rule, we must expect a change in the result. If the case comes under treatment late, the resisting power of the disease will be greater, hence the result of the bath will deviate from that here depicted. The type of the severity of the disease, too, will exert its influence upon the latter. If the temperature fails to be favorably influenced by the systematic baths at 65° F., a lower temperature for a more brief period, not below 60° F., will be found useful in the first two weeks of the disease."

It must not, however, be supposed that Brand's rule regarding the temperature of the bath water is inflexible for all cases. In a recent letter to Dr. Baruch, Brand states that in cases in which the patient has been ill for over four days, and in certain others in which the patient is bathed from the start, he always resorts to water of a higher temperature, usually that of the room, for the first twenty-four hours. This is in accordance with Bouveret, who, in 100 cases treated strictly by the cold bath, had a mortality of but 3 per cent., the average date of admission of the

fatal cases being the sixteenth day. In the treatment of these, Bouveret used initial baths at a temperature of 80° F., reducing the temperature of the bath to 65° F. if the fever did not yield readily.

Baruch points out that in cases coming under observation late, the condition of the heart is the chief index to the temperature of the bath to resort to. He states that reaction from a bath of 65° F. requires a certain integrity not only of the central nervous system, but also of the heart muscle. Should the febrile process have been long continued, degeneration of the cardiac muscle is not unlikely. In such a case the bath technique must be modified to meet the indications; at first, only the graduated bath of Ziemssen or the wet pack may be used, or a warm bath with cold affusions followed by friction; subsequently, should considerable improvement in physical tone occur, the regulation Brand method may be applied.

The importance of insuring a good reaction from the bath cannot be too strongly urged. In proportion as the patient reacts badly, and shivering and blueness of the extremities occur and continue, is the object for which the baths are given defeated. Therefore, friction of all parts of the body, save the abdomen, is absolutely essential. It is often desirable, and indeed necessary, to administer a stimulant after the bath. This, preferably whisky, should be given in hot water. It is my practice in many cases to give a

half-ounce of whiskey immediately before the bath and a cup of hot meat-broth immediately after. When reaction is poor, despite friction during the bath and stimulants immediately before or after, hot bottles should be applied to the extremities within the blanket. Nitro-glycerin may also be liberally used, either with the hot toddy or beef broth.

There certainly seems no doubt that no such results are obtained by means of the pack or the graduated bath of Ziemssen as with the method of Brand rigidly enforced.*

Treatment by prolonged warm baths has been recommended by Reiss, of Berlin, and practiced by himself and others as a substitute for the Brand method, as a means of slowly though permanently extracting heat. In this, the patient is immersed in a bath of 88° F., suspended from a hammock. The patient remains in the bath by day and, if necessary, by night until the rectal temperature reaches 100° F. On a recurrence of the former temperature, prolonged immersion is again practiced in the same manner. Reiss reports very good results; his mortality (8.5 per cent.) is lower than that by the graduated-bath method, in a series of 809 cases.

* With the Ziemssen bath the water temperature is at first 90° F.; subsequently it is reduced to 72° F. for a half-hour. Ziemssen especially recommends these baths for use in private practice. The mortality of 2,000 cases treated by the graduated bath of Ziemssen was 9.6 per cent.—far higher than that by the strict Brand method.

This method, however, is not comparable to that of Brand when the application of the latter is at all feasible. The last is certainly gaining headway in this country, not only in hospitals, but in private practice, under such strong advocates as Wilson and Baruch. At least one obstacle to its general adoption, apart from the prejudice and opposition to the method to be overcome on the part of the laity, is the difficulty of procuring at short notice suitable bathing arrangements. Portable tubs to meet the emergency have recently been suggested.

Regarding contra-indications to the use of the Brand method, the small mortality attending the cases in which the baths are used, the early appearance of benefit from them, with lessening of all complications, indicate that few if any disadvantages appertain to them. It has been said, but on no evidence, that the tendency to intestinal hæmorrhage is increased. The statistics of Brand and others show conclusively that the reverse is the case. The patient, of course, must not be subjected to the bath if peritonitis or perforation has occurred, or if he should be in a state of collapse from any cause whatsoever.

The diminished utility of baths in cases coming under observation at the middle or late stage of the disease has already been spoken of, but even in certain of these the benefit from the Brand treatment is most striking. Should the condition of the cardiac muscle warrant the use of the plunge, indicating some

ability to react, however late the case be seen, the baths should be administered. If the reaction is poor, or the plunge be not used for fear of the latter, it would be well, as Brand advises, to rather resort to the wet pack or to a warm bath with cold affusions followed by friction. This, Baruch remarks, may restore the lost stamina, and, later, enable us to resort to the cold bath if symptoms demand it.

SPECIFIC AND ANTISEPTIC TREATMENT OF TYPHOID FEVER.

Although typhoid fever is in all probability due to one or more micro-organisms, the products of the life's growth of which originate the assemblage of symptoms constituting the disease, little has yet been done, though much has been proposed and tried, toward destroying the *materies morbi* in the body, or directly antidoting the typhoidal toxines, by the administration of drugs. It must be said that as yet, unfortunately, no actual specific or antidote has been discovered. Were typhoid fever, as is cholera, for a time a local disease, its early symptoms due to the irritant action of bacilli in portions of the body not beyond the reach of the application of specific remedies, much might be hoped for from the use of certain insoluble intestinal antiseptics, such as the naphthols or their salts, the former of which are of such utility as germicidal agents. But unfortunately, though like cholera the complexus of symptoms is chiefly if not altogether due to the toxines originated by the micro-organisms, unlike cholera the typhoidal germs, besides having a nidus in the lymphoid elements of the bowel, early enter the interior of the body, through the alimentary canal, gaining entrance to and multiplying in the mesenteric glands, the spleen, and the liver. They thus become wholly inaccessible to insoluble antiseptics.

Toward neither the germs themselves, when systemic infection by them has occurred, nor their specific poison, has any antiseptic drug thus far proposed been found to exert so distinctly antidotal an influence as to be depended upon in any given case to surely render the course of typhoid fever mild or to abort the disease. It is, however, a fact that must be admitted, and indeed is by many careful clinicians, that in the treatment of typhoid fever by certain of the antiseptics, to be hereafter mentioned, results invariably better have been obtained than those by either the expectant or the expectant-symptomatic method alone. A few of these antiseptics offer such promising results, largely through their power of destroying the toxic alkaloids and the germs producing them, that one or more of them would be well worth trial as a routine treatment in typhoid fever, did we not have in the early application of the Brand method a plan of treatment which, it would appear, may be depended upon to furnish better results in all cases than any other.

Although it is impossible to investigate the Brand method without being satisfied as to its great superiority, unfortunately, at the present time, it is difficult of application in private practice, both because of lack of convenience and attendants for its successful operation, and on account of the prejudices of those near the patient, who cannot but look upon the cold bath in cases of illness as barbarous in the extreme,

if not actually homicidal. Were conveniences at hand, and attendants upon whom one could depend, a few days' application of the method would probably convince the most skeptical of its harmlessness and beneficence. But with trained attendants lacking, even did the ingenuity of the physician overcome the difficulty of lack of portable bathing contrivances, it would require not only great resolution on his part to master the family prejudices, but willingness and ability to sacrifice much time and comfort in constant personal attendance on the patient, in order that the method might be pursued with that eye to the minutiæ so necessary for success. For these and other reasons, too apparent to be dwelt upon, its applicability in private work is often practically out of the question, and one must have recourse to other modes of treatment. Of these the most promising is the use of antiseptics which are supposed to have some power over the infective principle of the disease, either as it occurs in the bowel or in the stomach. Among the remedies supposed to be of some utility in this direction may be especially mentioned the naphthols; naphthalin; thymol; a mixture of carbolic acid and tincture of iodine; quinine; sulphurous acid; chlorine-water; and calomel.

Of the various remedies suggested for their antiseptic effect, I have long especially favored the use of naphthol-β. This drug, which I first began to use many years ago under the guise of "hydro-naphthol"

—a proprietary preparation which I have recently* shown is identical with ordinary impure naphthol-β—possesses many advantages over other antiseptics proposed for their local intestinal action in typhoid fever.

There is no doubt that—from the gastro-intestinal catarrh present in typhoid fever of microbic origin, largely due to specific infection of the bowel by the typhoid bacillus, with secondary absorption of poisonous toxines there generated—a microbicide, to be of service, should be a more or less ideal intestinal antiseptic. As I have elsewhere† expressed it, in suggesting a remedy for cholera, it should be one but slightly soluble and decomposable, yet a germicide in aqueous solution, and both non-toxic and non-irritant in doses sufficient to exert a germicidal action.

In the first place, purified preparations of naphthol are absolutely non-toxic in any dose possible to be ingested, as has been conclusively shown by Bouchardat and others,‡ and it is likewise unirritating in doses sufficient to exert and maintain an antiseptic effect in the bowel. Naphthol has been shown to be especially inimical to the typhoid germ, and has, moreover, as Teissier of Lyons has shown, a marked effect in preventing the production of the toxines of

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* *Medical News*, April 1, 1893.

† *Medical News*, Oct. 1, 1892.

‡ See my paper on "Treatment of Cholera by the Naphthols," *American Journal of the Medical Sciences*, April, 1893.

the disease, both during the fever and in convalescence. From its utility in my hands in cases of simple diarrhœa, dysentery, and other ailments dependent upon microbial infection, I began its use several years ago in the treatment of typhoid fever in both hospital and private practice, and still employ it, either alone or in combination, in certain cases in which the cold-bath treatment is used, believing that my results with it are better than are obtained by other antiseptics proposed; and in this I have recently been supported by Bouchard, Petresco of Bucharest, Clarke of Bristol, Tiessier of Lyons, Moncorvo of Rio Janiero, Maximovitch, Mason of Boston, and others.

My usual mode of administration of naphthol is to give it very finely pulverized in the form of powder, wafer, capsule, or emulsion, with a suitable excipient, in doses of five to ten grains, three to five times daily. Bouchard, who has had excellent results with beta-naphthol in typhoid fever, administers it in daily doses of one to four grammes, in combination with an equal quantity of bismuth salicylate.

Petresco reports that he has had more favorable results with naphthol than with any other remedy; he gives it in doses of a gramme three times daily, and believes that under this dose the course of the disease is favorably modified.

Clarke, of Bristol, who, like Mason of Boston, is unaware of the identity of the so-called "hydro-

naphthol" and beta-naphthol, reports* also very favorably on the use of the latter and its proprietary double in typhoid fever. As a result of the use of naphthol in a number of cases, he reported a reduction in the average duration of the fever, modification of the offensive smell of the passages, more or less relief of abdominal tenderness and meteorism, with early clearing of the tongue, and less dryness of mouth and lips; convalescence, also, seemed more rapid, and tendency to secondary complications was diminished.

Mason† reports a series of 675 cases treated with hydronaphthol (impure beta-naphthol). His results were excellent.

Tiessier and Maximovitch prefer alpha-naphthol to its isomer beta-naphthol. The former gives it in six-grain doses, combined with bismuth salicylate, and also promotes free diuresis by the use of cold-water enemas; he found that as soon as intestinal antisepsis has become established by this means, the urine becomes green, temperature falls, albuminuria if present disappears, the spleen diminishes in size, the tongue becomes moist, and convalescence is rapid.‡ It must be recollected that alpha-naphthol, which in

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* *Practitioner*, December, 1888, and July, 1890.

† *Boston Medical and Surgical Journal,* Nos. 14 and 15, 1892.

‡ See Yeo on the "Antiseptic Treatment of Typhoid Fever."

antiseptic power may slightly exceed beta-naphthol, is somewhat more irritating and of more disagreeable taste, and so should not, as a rule, be preferred to its congener.

Certain salts of beta-naphthol, the *salicylate* and *benzoate*, I regard as highly promising remedies in the treatment of typhoid fever. These salts have but slight taste, and that aromatic and agreeable, and are also entirely unirritatihg in even very large doses. Æsthetically they are decidedly preferable to beta- or alpha-naphthol for internal administration. Although in their unchanged state they are without germicidal power, and it has been thought are less readily decomposed into their respective acid and active germicidal base than phenol salicylate (salol) in an alkaline medium, from the results of both clinical and laboratory experiment I have found both remarkably efficient as intestinal antiseptics, especially beta-naphthol salicylate. I can, therefore, now recommend their trial, not only in typhoid fever, but in cholera.

My experiments have been principally with beta-naphthol salicylate (betol), which has yielded excellent results in several cases of chronic diarrhœa in which beta-naphthol in full doses was too irritating. In one of these the ailment was dependent upon intestinal indigestion originated by marked HCl hyperacidity. In a number of experiments made, I found that, even in cases of hyperacidity of the gastric

juice, if the remedy was exhibited immediately after meals, its decomposition was assured, with a salicyluric response in the urine inside of an hour, indicating its ready disassociation into its components in the upper bowel. In a case of chronic diarrhœa dependent upon intestinal indigestion due to gastric hyperacidity, it was interesting to note that no beneficial result followed when its ingestion was delayed from immediately after meals to three hours subsequently. Both betol and benzonaphthol, of which two I prefer the former, may be given in doses of twenty to forty grains several times daily, and are well worthy of a thorough trial in typhoid fever, as in cholera. Unfortunately they are much more expensive than is beta-naphthol.

Naphthalin, which formerly received extensive trial in typhoid fever—by many combined with calomel, which was believed to increase its efficiency —is decidedly inferior, as an intestinal antiseptic or disinfectant, to the naphthols, or their salts already mentioned, and is moreover much more toxic than naphthol. It was first recommended by Rossbach, who believed that it exerted an abortive effect on the disease. His claims, however, were not supported by Furbringer either clinically or bacteriologically, though the remedy was carefully tried in 100 cases and administered in daily doses of from three to five grammes. More recently L. Wolff, of Philadelphia,*

* *Medical News*, May 23, 1891.

reported a consecutive series of 100 cases treated by naphthol, with a mortality of about two per cent. Wolff looks upon the drug with great favor. He believes that it exerted an abortive action in sixteen of his cases. Any intestinal antiseptic action which naphthalin may have, he attributes to its conversion into naphthol in the bowel. If naphthalin is tried, it may be administered in daily doses of fifteen grains to one drachm (one to four grammes) finely pulverized with coffee, or in emulsion or capsule. These latter should contain a small quantity of an essential oil, such as bergamot, to assist in concealing the disagreeable odor. It is important that only purified naphthalin be prescribed. In an instance in my practice in which a druggist substituted an inferior preparation (commercial tar-camphor) for the former, hæmaturia and other signs of renal irritation, such as loin pain, resulted from a dose totally insufficient to cause such symptoms from an equivalent quantity of the pure drug.

Liebermeister, Wunderlich and others claimed that the use of calomel in typhoid fever tended materially to shorten the duration and lessen the intensity of the disease, and Wunderlich even believed that the disease might sometimes be aborted by its use. Liebermeister treated several hundred cases with calomel, usually giving three to four 8-grain doses in the first twenty-four hours of treatment, at an early period of the disease and before intestinal ulceration

was believed to have occurred. Most of his cases so treated seemed to do well and the fever to run a milder course.

Through the influence of the teachings of Liebermeister and Wunderlich, calomel has received a very general trial in typhoid fever, given either in several large initial doses, or in smaller amount throughout the course of the disease. There are none now who claim for it any specific effect. It is certainly without destructive influence on the typhoid germ, though it is inimical to ordinary fæcal bacteria. However, because of its being a very efficient and safe laxative, and on account of constipation frequently being present in the early stage of the disease, calomel has come more or less into general use in typhoid fever in the manner recommended by Murchison—one or two moderate doses (two to five grains) in the first week before the appearance of marked diarrhœa. Thus used, though calomel produces free purgation, it does not tend subsequently to aggravate diarrhœa. As the opinion seems well founded that the administration of an initial laxative dose in the early stage, prior to the date at which it is thought the intestinal lesion has advanced to ulceration, can do no harm and is often productive of benefit, calomel should be used unless another laxative has been taken by the patient just prior to coming under observation.

Henry, of Philadelphia, especially favors the use of thymol in typhoid fever as an intestinal antiseptic.

He recommends it in preference to all other suggested remedies for a similar effect. He states* that in every case in which he has employed the drug in an early stage of the disease the tongue has become rapidly clean and moist and has so continued; tympany, if present, has steadily subsided; diarrhœa has diminished, and mental symptoms have disappeared; and the temperature has been favorably influenced. These observations by so accurate and painstaking an observer indicate that thymol may have some special influence for good in this disease, and it is worthy of extended trial. I myself have never used it.

Apart from Henry's favorable clinical observations, theoretically thymol is worthy of trial because of its having an antiseptic potency of no mean order, amounting to four times that of carbolic acid. It is, moreover, but slightly toxic, and is more or less insoluble in the stomach and intestines. It may be given in amounts upward of forty grains daily. Henry rarely employs more than twenty grains daily, in quantities of 2½ grains every three hours. He prefers to administer it in gelatin-coated or in uncoated pills, with medicinal soap as an excipient. Water should be freely taken with the uncoated pill to insure its rapid passage into the stomach and thus obviate the unpleasant burning sensation produced should thymol remain in contact with faucial or œsophageal mucous membrane.

* *L. c.*, p. 307.

An Italian physician, Testi,* in the year following Dr. Henry's recommendation of thymol, reports results very similar to those of the latter with this drug in 150 cases of typhoid.

A remedy of an order similar to thymol deserves brief mention—the oil of eucalyptus. The utility of this in typhoid fever has been especially investigated by Kestevan, of Brisbane.† In 220 cases in which it was reported used by Kestevan, many of which he stated had a bad beginning, there were but four deaths. He gave from five to ten minims of the oil in emulsion with mucilage every four hours. To disguise the unpalatable taste of the oil, he combined it with sal-volatile, spirits of chloroform, and glycerin. Kestevan noted that under the eucalyptus treatment there was a reduction in the pulse-rate, a remarkable lowering of temperature, a rapid clearing and moistening of the tongue; that the skin likewise became soft and moist and the duration of the fever greatly shortened. A withdrawal of the eucalyptus was always followed by a return of unfavorable symptoms.

A mixture of carbolic acid and tincture of iodine, in either equal proportions or in proportions of one part of the former to two of the latter, has also been recommended for a specific effect in the treatment of typhoid fever, in doses of one to three drops several times daily. Bartholow highly lauded this combina-

* *Allg. Wien. Med. Zeitung*, No. 9, 1889.

† *Practitioner*, May, 1885, April, 1887.

tion, and it is still a favorite with many. I at one time tried it somewhat, with apparently good results. Because of its ready absorption from the stomach, its utility, if any is possessed by it (like that of sulphurous acid, and chlorine-water), cannot, of course, be through any local action on the intestinal condition. It would be especially indicated in the more rare cases in which nausea and vomiting are a troublesome symptom. The mixture of carbolic acid and tincture of iodine is of much utility for its local sedative action on an inflamed or irritated gastric mucous membrane.

Niemeyer and Murchison commended the use of sulphurous acid in typhoid fever; and Wilks of Ashford, and Yeo have reported quite remarkable results with it in this disease, though at the present time Yeo regards chlorine-water as a preferable remedy. Wilks used sulphurous acid largely, with marked benefit, in a considerable number of cases, some of which were of severe type. He found that it allayed vomiting and purging, when present; that it reduced tympanites, supported the pulse, moistened the dry tongue, and relieved thirst. He used the acid in 171 cases without a death. In most of these, convalescence ensued within fifteen days after commencing treatment. In a few of the early cases he discontinued the use of the acid, as the ailment rapidly yielded to it; a relapse then occurred, which was again immediately arrested on the resumption of the remedy. Wilks gives the acid in doses of three to

twenty minims, according to age, every fourth hour, and continues it for a week, or even longer, until the patient complains of tasting and smelling sulphur, or, in the case of infants, until an odor of the gas is emitted from their skin and breath. For adults, 20 minims of the sulphurous acid was mixed with an ounce of water and a little syrup of orange-peel, and given every four hours.

Two well known practitioners in Dr. Wilks's neighborhood, who also testify to the invariable success of this remedy in their practice, long ago brought it to the notice of Yeo, who also used it with good result, but subsequently abandoned it for what he conceived a better remedy, chlorine-water. This, many years ago, was also recommended in typhoid fever by both Sir Thomas Watson and Murchison. Yeo soon became so much impressed with the virtues of chlorine-water that he abandoned search for other specifics and has since treated all his cases with this remedy. He is now as enthusiastic concerning it as at first. The following is Yeo's plan of preparing the water: "Into a 12-ounce bottle put ½ drachm of potash chlorate, and pour on it 40 minims of strong HCl; chlorine gas is at once actively liberated. Fit a cork in the mouth of the bottle; keep it closed until it has become filled with the greenish-yellow gas. Then pour water into the bottle little by little, closing the bottle and well shaking at each addition, until the bottle is filled." This forms a

solution of free Cl together with some undecomposed potash chlorate and HCl. He greatly prefers this preparation of chlorine to the *liquor chlori* of the British Pharmacopœia. It is not only more pleasant to take, but results obtained with it are better. Yeo adds about half a drachm of quinine and an ounce of orange-peel to each twelve ounces of the solution, and gives an ounce every two, three, or four hours, according to the severity of the case. He thus gives, coincidently with the Cl, 12 to 26 grains of quinine daily, so that his treatment is a mixed one.

However that may be, he reports quite surprising results with the combination. One of these is a remarkable cleaning of the tongue. He states that a dry, dirty, thickly coated tongue is scarcely ever encountered in a patient who has been put on this mixture early. Other results he has noticed are: a modification and sustained depression of the febrile temperature; the abbreviation of the average course of the fever; a remarkable maintenance of the physical strength and intellectual clearness of the patient, with less need for stimulants; a greater power of assimilating food; a rapid and complete convalescence. The fetor of the evacuations also usually disappears within twenty-four hours after initiating this treatment. This he naturally regards as an interesting and important point, inasmuch as, from the solubility of the chlorine, it would be supposed not to reach directly the lower part of the bowel.

The antiseptic action which it exerts on the intestines is perhaps a systemic one through the blood, in which fluid Yeo believes it may neutralize some septic substance generated by the typhoid bacillus, so that the excretions into the intestine are modified and an antiseptic effect on the intestinal contents is produced.

As an indication that the active agent in these results is not quinine, Yeo cites a case in which, having deviated from his ordinary prescription, and writing for liquor chlori, B. P., with quinine, chloroform-water was substituted for the chlorine-water, with no little temporary detriment. The patient had previously been doing well on the chlorine-water mixture, and the temperature was maintained reduced. Unexpectedly, however, it arose from 101.6° F. to 104.4° F., and the stools once more became of offensive odor. A search for the cause of this untoward condition revealed the substitution, which was at once corrected, with corresponding prompt amelioration of the symptoms.

It appears to Yeo that it usually takes forty-eight hours before the treatment by chlorine-water begins to notably affect the temperature. He states that no surprise should be felt if the temperature rises a degree or more during the first twenty-four hours of treatment. This treatment, therefore, differs greatly in this respect from that with the numerous antipyretic medicines now so much used.

Quinine at one time was very generally used in

large doses in the treatment of typhoid fever, many fancying that it exerted some specific influence on the course of the disease. Its general employment fell into disrepute because of its indiscriminate use in excessive doses. It has now again become somewhat more of a general favorite with those who do not resort to the exclusive use of cold-bath treatment. Bouchard uses it in the treatment of typhoid fever, combined with naphthol and bismuth salicylate, contending that while the latter disinfect the alimentary canal, quinine acts as a general or systemic antiseptic, neutralizing the infective principle in the blood. He considers that its febricide action in this disease is largely due to its antiseptic effect.

It is worth while to quote Bouchard's statistics under this treatment, which tend to support his idea of its utility. At the Lariboisière Hospital, from 1854 to 1885, 12,246 cases of typhoid fever were treated, with a mortality of 21.15 per cent. The recent statistics under this treatment for four years, 390 cases treated, show a mortality of but 11.75 per cent. He states that his mortality amounts to only two-thirds of the whole mortality rate of the other cases of typhoid fever treated in the hospital during a period in which his method has been employed in his service alone (Yeo).

Bouchard gives quinine in such a way that though the average daily amount equals only 10 grains, the dosage at the early part of the treatment seems ex-

cessive. During the first fortnight a half-drachm is given in the evening, in four doses of 7½ grains every half-hour, at intervals of three days. In the third week the half-drachm is reduced to 22 grains, and in the fourth week to 15 grains.

Graucher adopts a similar plan in the treatment of typhoid fever in children, and holds that quinine has a specific antiseptic action.

Yeo, in speaking of Sir Thomas Watson's advocacy of quinine in typhoid fever, remarks that when a remedy returns repeatedly into favor and impresses successive generations of physicians from time to time with the idea of its value and efficacy, there seems no doubt that this belief has foundation. He says that what is needed to crystallize these observations into an established therapeutic practice is a central idea unchanging, because true—a generalized deduction from observation or experiment. This idea is now furnished us by the knowledge of the antiseptic influence of quinine. Yeo then calls attention to the fact that Eberth has shown that quinine exerts a powerful antiseptic effect on the typhoid bacillus. Yeo has, therefore, much the same opinion of the utility of quinine as Bouchard, and employs it, as has been stated in the foregoing, in combination with chlorine-water. He thinks that the efficacy of quinine depends largely upon the mode of administration, and especially noticed this in giving quinine in pneumonia and in attacks of influenza. When he

prescribes the quinine, dissolving in citric acid and given in effervescence, by adding it to an alkaline mixture, he finds that doses of two to three grains exert a powerful antiseptic effect—much greater than that obtained by the same amount of quinine given in the dry state.

A form of specific treatment of typhoid fever other than the antiseptic must be now briefly referred to, the value of which is still *sub judice*. It is that by parenchymatous injection of diluted cultures of the specific typhoid bacillus, and also by the use of dead cultures of another bacillus, the product of the activity of which is unrelated to that of the bacillus of typhoid fever. That such a search for specific treatment of typhoid fever would certainly be made, was apparent long ago, from experiment having been undertaken in analogous directions with some evidence of success, and from the increasing trend of inquiry for immunizing and antidotal substances derived from bacteria or the product of their life activity. Fränkel* reports treating fifty-seven cases of typhoid fever by parenchymatous injections of a sterile culture of dead typhoid bacilli previously rendered non-toxic by growing on bouillon made from the thymus gland of the calf. The injections were given in initial doses of 0.5 c.c., followed on the

* *Deutsche Med. Woch.*, Oct. 12, 1893.

second day by 1.0 c.c. The second and larger injection was attended by rise of temperature, and, in certain of the cases, by slight or more severe rigors. The injections were now given on alternate days, the dose being increased 1.0 c.c. on each occasion. The particulars of the results and details of the method cannot be given here. For them the reader is referred to the interesting paper of Fränkel. It here suffices to say that the method may be regarded as promising. Under the injections, remissions in fever promptly occurred, soon followed by its total disappearance and by that of the constitutional symptoms of the disease.

Fränkel's results and the knowledge that the previous existence of certain modified infectious ailments creates immunity from related diseases, suggested to Rumpf † to try the experiment if the course of typhoid fever might not be favorably influenced by the introduction of bacterial products different from those generated by the specific bacillus of that disease. He therefore began experiments with the use of sterile dead cultures of micro-organisms of a kind totally unrelated to the sort originating typhoid fever. After a trial of cultures of streptococci without result, he resorted to the use of cultures of the bacillus pyocyaneus, grown in thymus-gland bouillon. With that Rumpf has now treated by subcutaneous injection

† *Deutsche Med. Woch.*, Oct. 12, 1893.

thirty cases of typhoid fever, with results which he regards as only slightly less favorable than those of Fränkel.

The practicability and probable actual value of this novel method of treating typhoid fever must remain for some time undetermined. It is not too much to say that something may be hoped for it in the light of recent developments as to the causation of the infectious diseases, and their prevention and cure by the use of immunizing substances derived from micro-organisms.

Regarding this particular plan of treating typhoid fever, the following is of interest, quoted from the *Medical News* of Dec. 16, 1893, which thus notes this method editorially: "Buchner (*Münchener Med. Woch.*, 1893, No. 43), in commenting upon this work, expresses his satisfaction with the results, especially with the conclusions of Rumpf, and points out the analogy between Fränkel's work and the treatment of tuberculosis with tuberculin. From a bacteriologic standpoint, typhoid fever has to be looked upon as a fight of several weeks' duration between the animal organism and the typhoid bacilli in the intestines, mesenteric glands, and other organs. On the part of the human body the war is carried on with the aid of an inflammatory (and febrile) reaction, an attempt being made, either through the activity of the leucocytes (?) or through germicidal substances newly formed in the tissues (of the nature of which we are as yet ignorant),

to bring about the destruction of the invading bacilli. Buchner, therefore, views the aim of these bacterial injections just described as an effort to render this 'curative reaction' more intense, and thus more effectual, exactly as was that of the treatment of tuberculosis with tuberculin. Here we have nothing to do with antitoxic influences, or with the production of immunity, nor have these effects (as Rumpf has pointed out) essentially anything to do with 'specificity,' any more than have those of the tuberculin-reaction, as was shown for the latter two years ago by the fact that it can be set up by the products of bacteria other than tubercle bacilli. The seat of reaction is, however, determined by the localization of the lesions of the specific disease, apparently because there the tissue elements are already in an abnormal state of excitation, and can all the more easily be aroused to a still greater activity. Very different substances are capable of calling forth the reaction. We already know that the protein-substances contained in the bodies of different kinds of bacteria can give rise to it, and it is probable that other substances which cause a leukocytosis or a local inflammation can serve the same purpose. It will be necessary, as Buchner says, to determine how much, if any, of the effect produced by these injections of Fränkel and Rumpf is directly dependent on the extract of thymus which is employed in the preparation of the bouillon, for experiment has shown that the extract exercises a

positive chemotic influence, as do the bacterial proteins themselves."

Before discussing the treatment of special symptoms and complications, the following important words of Broadbent bearing upon their recognition may be quoted with advantage: "The most careful watch should be kept for complications at all stages of the fever, but especially after the end of the second week. A rise of temperature must always be taken to have some definite significance requiring explanation. With increased frequency of respiration, it may be the sole indicative of the accession of pneumonia or pleurisy. A fall of temperature may give warning of hæmorrhage. Retention of urine, though uncommon in typhoid as compared with typhus fever, should always be borne in mind, and unusual restlessness should at once suggest an examination of the hypogastrium. The passage of a catheter has often put an end to sleeplessness and exhaustion. Bed-sores ought never to occur, and it will conduce to their prevention for the medical attendant to inspect the sacral region and other parts where they are liable to be produced."

TREATMENT OF SPECIAL SYMPTOMS AND COMPLICATIONS.

Constipation at the outset, and prior to the stage of the disease at which it is believed intestinal ulceration is present, should be met by one or two rather good-sized (two- to five-grain) doses of calomel, as previously indicated. Later, moving the bowels by simple enema on alternate days is preferable to the employment of medicinal laxatives which might lead in turn to diarrhœa difficult of control, and to aggravation of the intestinal ulceration. During late convalescence, if constipation be the rule, an occasional small laxative dose (one to two drachms) of castor oil, or small dose of calomel (one-half to one grain), may be employed, or a non-griping preparation of cascara combined with belladonna may be used. Broadbent calls attention to the importance of removing rectal accumulations by enema before resorting to the use of laxatives by the mouth.

Diarrhœa.—Careful, painstaking supervision of the diet of the typhoid case from the start, which necessitates, of course, daily inspection of the stools, will in most cases prevent the occurrence of excessive diarrhœa. It must be remembered that diarrhœa is in a measure conservative, and when moderate in amount, not exceeding three to five stools daily, should not be interfered with. If the number of pas-

sages is excessive, and especially if they are very fluid, an effort must be made to diminish their frequency and alter their character. This last can often not be done until some alteration in diet is brought about.

Excessive use of both milk and beef-tea is a fruitful source of increased intestinal derangement in typhoid fever. Should curds appear in the stools, milk must either be withdrawn or, if continued, must be more thoroughly diluted, either with plain water or with an alkaline water, or it must be administered predigested. Beef-tea, or strong beef-broth of any sort, must not be given in too concentrated form, as the salts it contains often irritate the already hypersensitive and inflamed bowel.

For the medicinal control of diarrhœa, some of the antiseptic remedies already considered may be used, such as beta-naphthol, especially combined with bismuth. The naphthol must not be used in too large a dose, lest it itself have an irritant action. From three to five grains of the re-sublimed medicinal beta-naphthol of Merck, finely pulverized with aromatic powder, and combined with five to ten grains of bismuth salicylate or subnitrate, may be administered every third hour. A small amount of aromatic powder of chalk and opium (B. P.) may take the place of simple aromatic powder and of the bismuth. Or beta-naphthol salicylate (betol) may be used alone, in doses of ten to twenty grains every two to

four hours. This last, before mentioned in detailing the specific treatment of typhoid fever, is the most elegant and efficient of the numerous antiseptics. It is tasteless, non-irritant, and non-toxic, and further, more efficient than is salol. A new salt of naphthol, beta-naphthol-bismuth, will doubtless prove of much efficiency for the control of diarrhœa in typhoid fever, as well as that of infectious bowel ailments of other origin. Beta-naphthol-bismuth was lately described by Jasenski (*Arch. des Ss. Biolog.*, v. ii., No. 2). It is a comparatively tasteless salt of naphthol, and contains 80 per cent. of bismuth oxide. It is non-toxic, so may be given in large doses with safety, though from one to four grammes will usually be found efficient for all purposes. It is stated that this salt of naphthol is decomposed by both the gastric and the pancreatic juice. Among other drugs that may be used is opium, preferably in the form of MacMunn's Elixir; or an opium suppository combined with iodoform and a small quantity of belladonna may be employed. Pepper regards silver nitrate as the best remedy for the control of intestinal catarrh, including diarrhœa. Nitrate of silver, as is well known, is Pepper's favorite drug in typhoid fever, irrespective of symptoms; he is inclined to look upon it as approaching somewhat the specific in its action upon the catarrhal and ulcerated lesion of the gastro-intestinal mucous membrane, and routinely prescribes it in all cases of the disease. When diarrhœa is excessive he

uses it in pill form in doses of one-fourth grain, combined with extract of opium in a similar or a less dose. An enema of tincture of opium (twenty to thirty drops in half a fluidounce of starch-water) is also efficient and much used for the control of diarrhœa.

Gastric irritability is sometimes so excessive as to demand special medication. Attention should first be paid to the diet, which will usually require some modification. All drugs the use of which is calculated to further disturb the system should be withdrawn. A light animal-broth, of the sort most agreeable to the patient, or peptonized milk or peptonized-milk gruel, is the best food used in small quantity. Or milk may be taken largely diluted with lime-water or in an effervescing alkaline water. Minute doses of calomel, one-twenty-fourth to one-eighth grain every half-hour until one to two grains are taken, are sometimes very efficacious in controlling vomiting, and should be used at the outset if constipation is present. Equal parts of carbolic acid and tincture of iodine, in one-drop doses with half-ounce of dilute mint-water as the excipient, being still more largely diluted at the bedside, is often of great efficiency in controlling both reflex vomiting and that due to excessive gastric irritability. Nitroglycerin, in drop doses of the centesimal solution, is often also singularly efficient in the control of vomiting in gastric catarrh, and may be of great use here. Another promising, and recently recommended, remedy is menthol. This last is best

used in 20-per-cent. solution in olive oil, of which 10 drops are administered, made into a mass with pulverized sugar at the bed-side, and ingested with a sip of water. This should be taken on the occurrence of nausea. Strontium bromide, in doses of ten to twenty grains, repeated every second hour, is also sometimes of great utility. With the last, hydrocyanic acid may be combined, the whole administered in dill- or mint-water. Vomiting dependent upon perforation and subsequent peritonitis, we can of course only hope to subdue by morphine, which must be given hypodermically.

Management of High Temperature.—The most important mode of combating high temperature is that by cold baths, which has been considered in a previous portion of this book as the essential part of the management of the disease itself. It was there asserted that the cold-bath treatment, though the most satisfactory to maintain the temperature within proper bounds, also exerted a general influence for good on the course of the disease so far-reaching in its effects, that to term it simply a method to reduce temperature is to notably fail to grasp its great utility and beneficence. Even if the strict Brand method cannot be carried out, the cold bath should be preferred to the employment of an internal antipyretic. The plunge at a temperature of 65° to 70° F. is to be preferred to other modes of using water, and when resorted to should be strictly on the lines already fully

laid down. Energetic friction of the extremities, chest and back during the bath, must not be for gotten, to insure reaction, and the use of stimulants or hot meat-broth may be resorted to afterwards as detailed. The pack is decidedly inferior to the plunge, yet may have to be resorted to in absence of facilities for the proper application of the latter. Baruch points out that "as an antipyretic, the cooling effect of the pack is limited to the first few minutes; the vessels are rapidly contracted by the shock of the peripheral nerves; the cool blood is sent to the interior only until the reaction is established. Now, however, the sheet surrounding the heated body rapidly absorbs its heat; there being no accession of cold as in the bath, the now dilated superficial vessels do not receive cooled blood to carry to the interior, as in the cold bath. A second pack is required. The patient, now warm, his superficial vessels dilated far better than in the cold bath (with friction), is wrapped again in a sheet wrung out of water at 60° F. The stimulating effect is pronounced; the patient is refreshed; the blood, cooled for a few minutes on the surface, rapidly diffuses its lowered temperature in the interior. But very soon equalization of temperature between the body and the sheet takes place, which, according to experiment, requires about ten minutes. A third and a fourth pack must be resorted to, each one reducing the temperature slightly by the process indicated. Liebermeister has demonstrated

by actual trial that four successive packs, of ten minutes each, reduce the temperature only as much as a cold bath of ten minutes. Hence it would require about five or six packs, lasting over an hour, to produce the same effect as one of our 65° Brand baths of fifteen minutes."

For the further technique of the pack, the reader must consult Baruch's excellent book. Either one pack after another may be used as Baruch suggests, until the temperature is lowered as desired—the indication for the change of sheet being the degree of warmth communicated to the superimposed sheet and blanket; or the patient may be wrapped in a sheet wet with cold water, and the sheet then freely sprinkled with cold, even ice-water, thorough friction being used at the same time through the sheet by an attendant.

When baths or the cold pack cannot, for some reason, be used, at least in mild cases the body may be frequently sponged with cold water whenever the temperature reaches 102° to 102.5° F. A bladder of ice may be kept more or less constantly about the head, tied to the headboard; or Leiter tubes may be used to the head. Cold compresses should be kept upon the abdomen in all cases; the cloths of these should be changed as soon as they have become warmed by the body.

The consensus of opinion of all careful observers and thinkers who have made use of the internal anti-

pyretics, since they have so freely come to us from Germany in recent years, is that they should be employed as little as possible for the control of pyrexia of typhoid fever. There seems no doubt that these antipyretics have absolutely no antidotal effect upon the cause of the febrile rise, which is again in active operation within an hour after the ingestion of the drug. It is also certain that their use increases very much the tendency to cardiac failure and collapse, an ever-present danger in severe cases of typhoid fever, and that their persistent administration prolongs the course of the disease and renders convalescence tedious. Ehrlich some years ago called attention to the obstinate splenic enlargement in cases in which thallin had been used; and the researches of Roque and Weil, before referred to, show that agents like antipyrin greatly diminish the excretion of the toxines of the disease, which, after the discontinuance of the antipyretic, become much increased during convalescence.* There are few now, even among tyros in medicine, who resort routinely to the use of the internal antipyretics in typhoid fever. But where the cold bath is inadmissible, and the pack or cold sponging alone is insufficient to keep the axillary temperature within 103° F., in a patient in whom the coin-

* This effect is directly opposite to that of the cold bath and different from that produced by naphthol, in that naphthol causes diminished excretion indirectly, by diminishing production, as has been stated elsewhere.

cident presence of mild cerebral or cardiac symptoms indicates mischief likely to result from the toxæmia producing the pyrexia, moderate doses of one of the internal antipyretics, such as acetanilid, antipyrin, phenacetin, or quinine, may be cautiously resorted to. As regards the coal-tar products especially, individual susceptibility must be borne in mind, as well as the tendency sometimes present in the latter stage of typhoid fever, and often in children, for a sudden drop of temperature to occur—a natural crisis, which, resulting coincidently with the employment of a few doses of one of these antipyretics, might cause a fall not outside the limit of danger.* It is better to resort to a minimum dose, which may be repeated one or more times should the effect upon the temperature not be that desired. Five grains of antipyrin, or a similar or even smaller dose of acetanilid or phena-

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* Musser (Transactions of the College of Physicians of Philadelphia, p. 38, Third Series, vol. xiv), in mentioning these, speaks of a danger from their use, observed in hospital patients in the middle period of the disease, to be borne in mind. The excitement the patient is subjected to attending his admission in this stage, nearly always produces for the first twenty-four hours in which he is in the wards an unusually high temperature; this rise, undoubtedly the result of exhaustion and excitement attending removal, it would be dangerous to combat by the administration of antipyretic drugs. A temperature of 105° to 105.5° F., under these circumstances, is not unusual and should call rather for stimulants.

cetin, is usually sufficient, especially if repeated at intervals of half an hour until three or four doses have been taken, avoiding causing too great a depression in temperature.

As regards the use of quinine as an antipyretic, although few now favor its use in the massive amounts advised by Leibermeister some years ago—20 to 40 grains, in doses of 7½ grains at intervals of ten minutes—many rely upon a single dose of 10 to 15 grains as an antipyretic, in preference to the use of the coal-tar preparations. Leibermeister's method is to administer the quinine so that the whole amount be ingested within an hour, and in the evening, in order that the maximum effect may be exerted at the time of the usual morning remission. For my part, though I occasionally use quinine as a tonic in doses of two to three grains, every six hours, in typhoid fever where marked asthenia is present and the gastric condition is favorable, it so often happens that this drug disorders the stomach and aggravates diarrhœa that its utility is in the majority of cases questionable. At least, for antipyretic effect there is little doubt that smaller doses of antipyrin, acetanilid and phenacetin, are better borne and have a more tranquillizing effect upon the nervous system.

It must not be forgotten that there are some such, for instance, as Yeo, who regard quinine as a systemic antidote for the poison of typhoid fever, and believe that its antipyretic effect is exerted in this way.

These, as elsewhere stated, report striking contrasts from its employment, especially in combination with other antiseptics.*

Nervous Symptoms.—For insomnia, sulfonal, 10 to 15 grains, is the best remedy, administered by the writer's method,† thoroughly dissolved in hot water,

* A brief note must be made of a new and apparently promising mode of reducing high temperature in typhoid fever, a mode probably lacking the ill-effects resulting from the use of the internal antipyretics. It is the dermal application of guaiacol. Intelligence of its utility in the treatment of the pyrexia of typhoid fever, which has just been ascertained by Da Costa, comes too late to receive notice in the body of this work. Having in mind that guaiacol applied to the skin in cases of tuberculosis, produced a decided effect upon fever heat, through systemic absorption, Da Costa was recently led to try its effects in the pyrexia of typhoid fever. His results, published in the *Medical News* of January 27th, 1894, are most interesting. To this the reader is referred for details. Suffice it here to state that the guaiacol is applied by painting it upon the thoroughly washed skin of the abdomen, chest, or thighs. It then is slowly and gently rubbed in. The surface is afterward covered with lint and waxed paper. Da Costa's experiments were made in the Pennsylvania Hospital. He finds that a half-drachm is an average dose, though the quantity used on each occasion must be governed by the height of the temperature that it is desired to control. The effect upon the fever in the cases so dosed was remarkable, indicating that we have in the external use of guaiacol a remedy of singular efficiency and utility as an antipyretic in typhoid fever. Whether its effects extend beyond mere antipyresis, is yet to be determined.

† *Medical News*, Jan. 31, 1891.

flavored if desired with a liqueur, and drunk while still in solution. It will often continue in effect for several nights. Or small doses of codeine (¼ to ⅓ grain) may be employed; or chloral (5 to 10 grains), strontium bromide (15 grains), and cannabis Indica (⅛ grain). Hyoscine hydrobromate is also useful, and may be administered singly or combined with a bromide or with chloral or codeine.

The presence of *headache* necessitates quiet, a darkened room, and ice-bag to the occiput or vertex; or, locally, a lotion of menthol in alcohol or in soap liniment should be used. If no relief is obtained by these, there may be given internally small doses of caffeine (½ to 1 grain), or cocaine ($\frac{1}{12}$ grain), combined with antipyrin (3 grains); or phenacetin (3 grains); or of antipyrin with strontium bromide (10 grains); repeated at intervals of a half-hour until two or three doses are taken. A combination of bromide, antipyrin, and caffeine or cocaine, or of antipyrin or phenacetin or sodium salicylate, or a small quantity of caffeine, or cocaine, in effervescing draught, a somewhat similar combination of which I have long used, Pepper recently advises in the American System of Practice.

Delirium, *somnolence*, and marked *restlessness*, associated as they so often are with elevation of temperature, are best combated by the use of baths, the sedative effect of which upon the perturbed nervous system of the typhoid patient is well known. As re-

gards drugs: bromides, camphor, valerian, and hyoscine are all beneficial. Musk, often recommended, is so difficult to obtain an active preparation of, that its use is practically out of the question. The elixir of the valerianate of ammonia, or preferably hyoscine ($\frac{1}{200}$ grain) repeated at intervals of two hours until several doses are taken, may be combined with one of the bromides, such as potassium (15 to 30 grains), or preferably strontium.

It is most important to observe the precaution especially urged by Pepper, that delirious patients be not left alone for an instant. They not only frequently endeavor to leave the bed, but in two instances of which I have knowledge, when not for the moment under surveillance, have sprung from an upper window to the ground, with fatal result. Pepper advises that before resorting to mechanical restraint, all the resources of kind and skilled nursing be first exhausted. "It may," he says, "be judicious to let the patient rise to a sitting posture, or sit upon the edge of the bed for a few minutes, after which his delirious restlessness may be for a time allayed and he will sink back on his bed in a more quiet state."

If the patient cannot be forcelessly restrained from too wide excursions, he must for the time be confined to the bed by passing a sheet about the body and fastening it under the bed.—The occasional dependence of restlessness upon a distended bladder must always be borne in mind.

Excessive tympanites may have two sources of origin: either excessive development of gas as a result of fermentative processes in the bowel; or less this than an unduly relaxed or paretic condition of the muscular layer of the intestine and of the abdominal wall, due to degeneration of the same. The second variety is more serious and more difficult to combat than the former.

Meteorism of the kind first described should be met by the administration of such insoluble intestinal antiseptics as beta-naphthol or one of its salts, already spoken of in describing the antiseptic treatment of the disease. If it is believed that the digestive functions are markedly impaired, fermentative processes occurring chiefly through the presence of undigested, decomposing aliment, nourishment should be given either peptonized or followed by the use of an artificial digestant, such as pancreatin and soda in the case of milk.

Meteorism not yielding to this treatment, especially if naphthol has been employed, may be considered to be rather due primarily to paretic muscular weakness, and should be met by the use of strychnia in full doses ($\frac{1}{60}$ to $\frac{1}{10}$ grain) every four to eight hours, and by the liberal use of stimulants, such as whisky. Turpentine by the mouth, enema, and externally in the form of stupes, is much lauded for the relief of tympany in typhoid fever, but I must confess that though I have often employed it, more especially

in severe types of the disease encountered in hospital practice, admitted at a late stage in the affection, I have rarely seen marked benefit result, save the transitory effect often obtained by its use in enemas.

Turpentine is employed largely as a matter of routine in this country in the treatment of typhoid fever, primarily through the teaching of the late George B. Wood, and at the present day through the advocacy of H. C. Wood. The elder Wood especially recommended its use for a specific effect upon the intestinal ulceration, and regarded it of the greatest utility in excessive meteorism accompanied by a dry brown tongue with sordes.

In the limited dosage in which turpentine may be employed, it cannot be regarded as possessing any marked antiseptic effects upon the parts of the bowel, so remote from the stomach, in which the chief lesions of the disease reside. Certainly, in doses of three to four minims, as those who most urge it for its antiseptic and specific effect upon the intestinal condition most advise, little may be expected from it. It may be worth a trial, however, where the other, more rational means fail, provided the meteorism is unaccompanied by much diarrhœa, and there is marked dryness of the mouth and tongue with browning and glazing of the latter and tendency to sordes, and particularly if bronchial catarrh is present. It should be given in emulsion diluted with water, in doses of five to twenty minims every two or more hours.

Extreme distension of the colon may be temporarily relieved by enemas of turpentine or of asafœtida introduced through a flexible tube, carefully passed to some height into the bowel. Or the tube itself may be similarly introduced, trusting through it to assist in the dislodgment of flatus.

Cold compresses to the abdomen, changed so soon as they become warm—a most desirable routine procedure in typhoid fever—are also of the greatest value both in preventing the development of paretic distension of the bowel and in removing that condition.

Abdominal pain attending great meteorism may necessitate the use of an opiate for its relief. Excessive and localized pain in the abdomen is significant of a limited patch of peritonitis, which last may be an important factor in the production of the paretic condition of the bowel.

The occurrence of *general peritonitis*, usually indicative of perforation, but sometimes having origin in extension of inflammation to the peritoneum from the base of deep ulcers, or in rupture of a softened mesentery gland, is apt in most cases to be fatal. The treatment for it is that for suspected perforation: the maintenance of *absolute* rest; the withdrawal, so far as is possible, of all food and drink (ice alone being permitted for the satisfaction of thirst); and the administration of a preparation of opium, or of morphia, to the limit of tolerance. Cold applications to the abdo-

men must be rigorously continued; but if collapse is threatened from *perforation*, heat must now be applied to the extremities, and nitro-glycerin, ether, or whisky administered hypodermically. The bowels must be kept confined by the free use of opium for some days after all symptoms have subsided; the idea being to favor, by all means in our power, the formation of adhesions at the seat of perforation.

Cœliotomy is not justifiable for suspected perforation during the course of typhoid fever, for, apart from the chances of generalized peritonitis having a less common origin than perforation in the cases that recover, the bowel is in too diseased a condition for hope of repair after operation. In perforation occurring during convalescence the case is different; here an abdominal section is justifiable.

The occurrence of *intestinal hæmorrhage* in other than minute isolated bleedings which show no tendency toward recurrence or the production of depression, necessitates the early use of full doses of opium to check intestinal peristalsis previously favored by contact in the bowel of the freshly outpoured blood. Absolute rest must, of course, be enjoined—even a folded cloth being substituted for a bed-pan, as Pepper suggests. Light ice-bags must be applied to the abdomen, especially in the cæcal region.

There is unfortunately no internal hæmostatic upon which we can with certainty rely, although ergot, lead acetate, aromatic sulphuric acid, gallic acid, and

oil of turpentine are all more or less highly recommended. Perhaps the best of these is turpentine, administered in emulsion in considerable doses. That which is least useful, and which, indeed, may be actually provocative of distinct mischief, is ergot, the most advocated of all remedies. Regarding the use of this drug in this connection I have elsewhere* remarked:

"A hæmorrhage of sufficient gravity in enteric fever to demand a resort to specific measures to cause its cessation, usually emanates from an eroded vessel. Ergot here, as in the hæmatemesis of gastric ulcer—also commonly dependent upon the erosion of an artery—is not only useless, but absolutely harmful, since, from its constricting effects on the vessels being limited to the arterioles and causing resistance *a fronte*, when a vessel larger than an arteriole is the source of hæmorrhage the increased blood-pressure results in augmentation of the bleeding. This fact, though of vast importance, is apparently known to few. It was pointed out some time ago by Dr. A. H. Smith, in a communication to the *Medical News* relating to the hæmatemesis of gastric ulcer. The principle underlying it should govern the administration of ergot for the control of hæmorrhage: to use in that produced by capillary oozing, to avoid in that resulting from rupture of a vessel larger than an arteriole.

* *Medical News*, Jan. 23, 1892.

"Still another important objection to the employment of ergot in the intestinal hæmorrhage of enteric fever is the fact that active peristaltic movements are thereby produced, the effects of which would inevitably be to disturb the ulcerated bowel, to provoke more rapid separation of the sloughs, and to aggravate the tendency to bleeding."

Collapse following hæmorrhage, of course necessitates the free employment of stimulants, of which the best is nitro-glycerin (two or more minims of a 1-per-cent. solution) in a syringeful of ether, hypodermically. Strychnia should be similarly employed. Heat must also be applied to the extremities; and if loss of blood has been great, transfusion of blood, or, preferably, the infusion of a normal salt solution at blood temperature into a vein, should be practiced. As the indications for this procedure are in every respect similar to those for the relief of the overwhelming acute anæmia succeeding gastric hæmorrhage due to an erosion of an artery, I cannot do better than quote from my section on the treatment of diseases of the stomach, in Hare's System of Therapeutics (vol. ii, p. 951), some remarks I there made concerning this subject: "Transfusion is indicated immediately after the occurrence of hæmatemesis only where it seems probable that the patient will succumb from the failure of circulation, experience having shown that the increased vascular pressure resulting from transfusion is likely to occasion anew

and, perhaps, fatal hæmorrhage by leading to the dislodgment of the thrombus blocking the open vessel. For this reason, the imminence of a fatal termination demanding some such interference, the risk must be taken, although only the smallest amount of fluid should be introduced capable of tiding over the dangerous period, and this must be injected very slowly under low pressure. These precautions are less necessary if transfusion is demanded because of the acute anæmia a few days subsequent to the hæmorrhage, when its reccurrence seems unlikely; here a larger amount may be introduced with but little risk.* In either event, if transfusion is demanded, the infusion into a vein of a saline solution should be preferred to the introduction of blood. The latter, in recent years, has been almost entirely replaced by the former, saline solutions practically fulfilling better than blood all the conditions, physical and hæmogenic, to meet which transfusion is undertaken, besides being far superior and easier of application. A ¾-per-cent. solution of common salt—about a drachm to the pint—is the most convenient. Not over three-quarters of a pint should be introduced at first. When a recurrence of the hæmorrhage is feared, more can be used later should the urgency of the symptoms demand it. These solu-

* The only risk then being perforation by the suddenly raised pressure if a diseased vessel in the ulcer is on the point of rupture.

tions should be made with boiled, preferably boiled-distilled, water. It must be of the body temperature and is readily introduced, all that is required being a small glass cannula, a piece of rubber tubing, and a funnel. When time admits of it, the fluid may be injected into the cellular tissue between the scapulæ in place of a vein. The resulting benefit would be as great, though not so promptly produced, and the danger, that of sudden raising of vascular tension, would be largely obviated."

Epistaxis is occasionally a troublesome complication in typhoid fever. Usually, however, it is readily controlled by ice compresses to the intercilium and bridge of the nose and to the nucha; by the injection of iced salt-water, or lemon-juice, or dilute vinegar, or a weak solution of tannin or of tincture of iron, into the nostrils. Remedies by the mouth are of but little avail, so that if the above or analagous measures fail it will be necessary to plug the posterior nares.

Cardiac weakness is to be met by the free, though judicious, employment of whisky, and by the use of strychnia, digitalis, or strophanthus. Strychnia may be resorted to, as may whisky, so soon as evidence of cardiac weakness begins to appear, indicated by tonelessness in the first sound at the apex. Whether the condition then, or later, be one of mere adynamia from over-fatigue, or arise from actual granular degeneration of the cardiac muscle fibres, the same remedies are indicated, save that greater caution in

the second case is required with the use of digitalis, in any event only to be added to our therapy of whisky and strychnia as a last resort. Strychnia may be given at first in doses of $\frac{1}{60}$ grain every eight hours, but this amount may have to be increased to $\frac{1}{15}$ grain, or even $\frac{1}{10}$ grain, every six hours, on the appearance of great feebleness or the extinction of the first sound. Digitalis is of little utility, and may indeed be considered a dangerous remedy, at least in the large doses often given, should considerable degeneration of the cardiac muscle fibre be suspected. When feebleness of action is thought to be rather the result of cardiac muscle fatigue, digitalis may be resorted to in moderate doses (5 to 20 drops) every six hours, but here its use is scarcely necessary with the employment of strychnia and whisky. The alkaloid caffeine (one to five grains) or its citrate (two to ten grains) is superior and a more efficient remedy than is digitalis, and may be administered with strychnia. For sudden cardiac failure, nitro-glycerin (1-per-cent. solution, two to four drops), in alcohol or ether, may be given hypodermically, and infusion into a vein of one or more pints of a warm saline solution practiced.

To assist in the avoidance of *hypostatic congestion of the lungs*, it is important not to permit the patient to lie too long in one position, especially upon the back. On its occurrence, counter-irritation to the chest as in actual pneumonia, or in extensive, severe

bronchitis, or in pleurisy—not infrequent complications of typhoid fever—should be resorted to. Mustard plasters or, better, turpentine stupes may be applied. If pain is present, hot poultices are useful; these must not be changed too frequently, and should be covered with oiled silk. The application of dry or even a few wet cups to the posterior surface of the chest may be required for the relief of pain or for the removal of extensive dullness, whether indicative of congestion or of actual inflammation. Turpentine is useful in pulmonary complications, as is terebene (five minims in capsule or emulsion every third hour), and other stimulating expectorants ordinarily used in these conditions irrespective of underlying cause. In catarrhal bronchitis or in pneumonia, ammonium carbonate may be used unless contra-indicated by diarrhœa; it is preferably administered in spirits of menderius. Strychnia and quinine may also be required. The occurrence of congestion of the kidneys, or of nephritis, necessitates the application of dry cups or of poultices to the loins, and, should the urine be markedly diminished in quantity, the use of a saline diuretic, such as cream of tartar, provided it does not aggravate diarrhœa.

Parotitis may be avoided by careful attention to cleansing the mouth with a mild antiseptic solution, such as very weak potash-permanganate wash, or one of hydrogen peroxide. Boro-glyceride is of utility if stomatitis exists. A mouth-wash of potassium chlor-

ate is also of use. Parotitis occurring is very apt to proceed to suppuration. It must then be managed on surgical lines. The application of counter-irritation externally, such as equal parts of tincture of iodine and of alcohol, is of value in aborting the swelling. If suppuration seems imminent, hot poultices should be applied, followed by a free incision should the presence of pus later be suspected.

Venous thrombosis of one of the lower extremities, more commonly the left, is not infrequently encountered in the later stage of a protracted case of typhoid fever, or more often during convalescence itself. It is due to circulatory debility, and may be guarded against by the steady use of stimulants and cardiac tonics during convalescence, should the first sound of the heart continue enfeebled and the pulse show much diminished blood-pressure. Then either strychnia, caffeine, digitalis, strophanthus or cactus grandiflorus may be used, one, or both of the first two, alone or in combination with one of the second group. On thrombosis supervening, it should be treated by absolute rest of the leg and its elevation on soft pillows. In the early stage, friction of the limb should on no account be practiced, because of the danger of detachment of a portion of the clot. Tincture of iodine should be painted along the line of the course of the affected vein, or, if there be much pain, hot fomentations may be first used. The limb should then be wrapped in absorbent cotton secured

by a broad bandage. A flannel bandage may be used instead of the absorbent cotton and muslin bandage, should pain and tenderness not be decided. When these lessen, mercurial-belladonna ointment may be applied, the bandage being continued to furnish support. Pepper recommends an ointment of ichthyol and lanolin, of each 2 drachms, compound iodine ointment ½ ounce, petroleum up to 1½ ounces. Later, on the disappearance of pain and marked subsidence of swelling, an elastic stocking should be worn to furnish support to the weakened vessel.

The treatment of *bed-sores* has been considered in detailing the general management of a case of typhoid fever, so will not again be dwelt upon here.

No mention has been made in the preceding portion of the book of the use of mineral acids, so generally employed some years ago in the treatment of typhoid fever before antiseptic remedies had come into vogue. The only mineral acid that can ever be indicated in this disease is HCl, the use of which is less as a medicament than as a digestant. In all pronounced cases of the specific fevers, the secretion of hydrochloric acid in the gastric juice is markedly diminished. In consequence of this, such albuminoids as may be administered are but imperfectly peptonized in the stomach, unless peptonization be favored by the administration of such an agent as HCl. The use of this acid may, therefore, be of much utility,

though it finds its special indication in convalescence, when more solid albuminoid aliment is craved and needed than the ability of the stomach to readily dispose of permits. During the fever, with a diet of milk or meat-broth, unless the latter contains considerable albuminoid material, HCl is not especially indicated as a digestant. For the digestion of milk the use of pancreatin and soda is preferable, while acid taken too near the time of milk feeding may interfere with the digestion of the milk by favoring the intra-gastric formation of too large coagula.

Though HCl, in common with other of the mineral acids, is one of the best disinfectants of the typhoid and other pathogenic bacteria, among which is prominently the cholera spirillum, and though its presence in the gastric juice in the normal percentage in those with healthy stomachs prevents many (in a manner easily understood) from developing typhoid fever who otherwise would, the administration of this acid after typhoid fever has developed, with the expectation of its having any germicidal influence on the parts of the bowel affected so remote as the ileum, is, of course, absolute nonsense.

A few words yet remain to be said regarding the treatment of the stage of convalescence of typhoid fever. The diet in this stage has already been discussed. It cannot be too strongly urged that solid food be not allowed too early, however well the patient be doing and however much appetite may be

felt. It is a safe rule, admitting of few exceptions, to neither allow the patient to sit up, out of bed, nor to allow solid aliment, until ten days after fever has disappeared. One exception to be borne in mind is that connected with what has aptly been styled the "bed-fever" phase of typhoid fever. This is one to which Da Costa has particularly called attention.

This "bed-fever" was recently referred to by Musser (*l. c.*), as follows: "There is a class of cases in which the morbid process has terminated, but—on account of the exhaustion, or the long continuance in bed, or the limited diet—the temperature keeps up or even continues to rise. Such a case was under my care last year. These have been spoken of as cases of bed-fever. In these the administration of an antipyretic would not have the desired effect. In these cases the fever is due to exhaustion, lack of food, and long continuance in bed. The use of stimulants, solid food, and getting the patient out of bed, brings the temperature to normal."

Apart from the cases of "bed-fever"—which are most likely to be encountered should the attack have been a protracted and a severe one—caution is at first necessary in the administration of solid food and in allowing the patient to get about. Should the case otherwise proceed favorably and yet the temperature be maintained, or even rise higher, on what has been a low diet, without obvious cause for the febrile exacerbation, its dependence upon exhaustion must be borne in mind, and treated accordingly.

In addition to the bed-fever of convalescence, the occurrence of the *febris carnis*, or what Henry prefers to call the *febris cibi*, occurring after meat or sometimes after any solid aliment, must be borne in mind, and should be met by the administration of digestants with the food taken, as has been before detailed.

Finally, in closing this *résumé* of the treatment of typhoid fever, a caution is necessary as to the absolute inutility of routine, objectless drug-prescribing. The danger of this cannot be too much kept in view. With those treating their first case of typhoid fever the tendency is to desire to do too much—in intention a laudable enough ambition, but one in actuality often provocative of great and irreparable evil to the patient. Whatever drugs are employed should be with the single idea of obtaining a specific result, it being at all times remembered that certain grave dangers await on over-medication; among which especially are those related to disturbing the already impaired digestive function and aggravating the gastro-intestinal catarrh, present as part of the disease; of interfering with necessary rest and food-administration by constant dosing; and of losing benefit by habituation which might be obtained when such drugs are rationally indicated later, as may be the case with quinine, with stimulants, and with many other such adjuvants to treatment often too freely and too early used in typhoid fever.

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